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ESSAYS ON REMITTANCE INFLOWS AND MONETARY POLICY IN DEVELOPING COUNTRIES

Doctoral Thesis

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SPECIAL DEDICATION TO MY MUM AND MY LATE FATHER

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Contents

[1] An earlier version of this paper is available as "Do Remittance Flows Stabilize Developing Countries in the Aftermath of Sovereign Defaults?"

1 Introduction

International remittances, the money that migrants send back to their home countries, are one of the key components of international capital flows. In 2017, officially recorded remittance flows to developing countries reached $466 billion and the amount is estimated to increase by about 4.1% to reach $485 billion in 2018. It has been observed that in many countries, remittances are larger and have exhibited more stability compared to foreign direct investments and, in certain scenarios, even larger than official development assistance. Most governments in developing countries have increasingly recognized the importance of remittance flows and are in the process of addressing constraints that hamper smooth flows in order to harness the benefits that remittances offer. This is occasioned by the fact that many developing countries are characterised by low domestic saving and high government expenditure. As a matter of fact, remittances which happen to constitute external source of finance play a critical role in local development and poverty reduction.

There is a vast literature on remittances and their role with respect to developing countries. This dissertation identifies the gaps in existing literature and covers the additional pertinent issues of consideration that would be of concern to researchers and policy makers. We begin by viewing remittances in positive light by considering the potential stabilizing role of remittances. We then proceed to evaluate whether remittances could potentially pose a risk to monetary policy transmission process owing to their cyclical nature. Within this framework, we deem it necessary to critically investigate the cause of cyclicality in remittance flows owing to the fact that existing literature is inconclusive. Having set the concept on cyclicality of remittances clear, we finalize our discussion by evaluating whether remittances promote financial inclusion.

The first paper, "*The role of remittance inflows to developing countries in the aftermath of sovereign defaults*" sheds light on the countercyclical role of remittances. We do this by taking into account sovereign defaults as an indicator of economic distress on the recipient economies and we evaluate whether remittances increase after the default episode. There exists a vast literature on the cyclicality of remittances and their role as shock absorbers but within this strand of literature, we consider sovereign defaults as a specific case of negative shock. All in all, our main aim is to evaluate how remittances could possibly assist countries cope with large negative shocks.

We conduct Dynamic System Generalised Method of Moments (GMM) estimation technique for 81 developing economies taking into account alternative default definitions and standard control variables. The results show that a sovereign default episode occasions an upsurge in remittance flows to developing economies thus contributing towards economic stability of recipient economies.

The second paper, "*Remittance inflows and state dependent monetary policy in developing countries*" which I coauthored with Peter Tillmann, provides an analysis of the business cycle effects of remittance inflows. We specifically focus on the interaction between procyclical inflows of migrant remittances and the transmission of monetary policy impulses under two

remittance regimes. The paper uses local projections methodology which allows for state dependent coefficients and state dependent impulse-response functions. We derive the evidence with respect to Kenya, Mexico, the Phillipines and Colombia.

We find that monetary policy effects are state dependent such that, in the presence of strong remittance inflows, a given policy shock is significantly less effective than under moderate inflows. This implies that procyclical remittances pose a challenge to monetary policy such that a tightening of monetary policy will be less effective if remittances surge concurrently. Ineffectiveness will also be observed in a scenario where policy easing takes place during episodes of exceptionally weak remittance inflows.

The third paper, "*Are remittances cyclical? The role of south-south flows*" coauthored with Peter Tillmann, revisits the cyclical nature of remittance inflows and the role of south-south remittance inflows. In the final analysis we provide new evidence as to why prior researchers could not come up with a consensus regarding the cyclical properties of remittances. We attain this by distinguishing north-south from south-south flows, and we show that a larger share of remittance inflows emanating from other low income countries significantly reduces the cyclicality of flows. Our results suggest that the large share of countries with acyclical remittance inflows can be explained by south-south flows.

The fourth and last paper, "*Do remittance flows promote financial inclusion?*" evaluates the extent to which remittances contribute to financial inclusion within the context of developing and emerging economies. This concept is built on the notion that remittances are inherently propoor and are direct in nature. Moreover, financial inclusion has been perceived as a fundamental underpinning of wider progress.

We construct a new index of financial inclusion and present single equation estimates of the effects of remittances on financial inclusion using data from 61 developing countries. We then employ GMM instrumental variables estimation techniques, and our results depict a positive and significant relationship between financial inclusion and remittances.

In general terms, we acknowledge the fact that although remittances are an important source of development finance, they are not a panacea to development issues.

All four papers are separate works and presented as such. The first and fourth papers are unpublished working papers. Both versions are available at the MAGKS website under Joint Discussion Paper Series section. The second paper is under review for publication consideration while the third paper is already published in the *Journal of International Trade, Politics and Development*.

Chapter 2

The Role of Remittance Inflows to Developing Countries in the Aftermath of Sovereign Defaults

The Role of Remittance Inflows to Developing Countries in the Aftermath of Sovereign Defaults

Immaculate Machasio*

Abstract

In this paper, we empirically examine what happens to international remittances in the aftermath of a sovereign default and the extent to which they contribute to resilience of the recipient economies. To this end, we conduct Dynamic System Generalised Method of Moments (GMM) estimation methodologies by Arellano and Bover (1995) and Blundell and Bond (1998) taking into account annual data cutting across 81 countries from 1990-2010. Robustness checks reveal that remittances play a significant role and are indeed resilient when evaluated in the aftermath of sovereign defaults. We find that the occurrence of a sovereign default spurs on an upsurge in remittances which play a stabilizing role in the recipient economy. The findings unravelled in this paper are important especially for policy makers to facilitate the process of harnessing positive benefits associated with remittance inflows to developing countries.

Keywords: Remittances, Sovereign Defaults, Capital Flows, Generalised Methods of Moments.

JEL classification: C23, F34, H63.

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1 Introduction

On an international level, migration tendencies in the recent past have depicted that migrants have become increasingly more directly involved in divergent socio-economic activities in their home countries. Migration and the associated remittances are becoming an ever increasing and important aspect of the global economy. Migrants have also been observed to have vested interest in their countries of origin and therefore send some money back home in form of remittances. Consequently, due to growth in remittances, considerable attention has been focused on these cross border transfers from both private and public sectors. Owing to the fact that remittances are considered to be unilateral transfers, they do not create any future obligations or liabilities for instance debt servicing or profit transfers. In contrast to other forms of capital inflows, remittances have been resilient, and they indeed represent a very significant component of the balance of payments of recipient countries.[1] Factors purported to have triggered rapid growth include: increase in international migration, remittance fee reductions as well as convenience of transferring money through formal channels and better measurement and reporting of remittances in the balance of payments statistics.

Remittances by international migrants to their home countries constitute the largest source of external finance to developing countries after foreign direct investment (FDI), as illustrated by Ratha (2003). These remittance flows are several times larger than remaining private capital inflows and official aid. For that reason, they are likely to serve as macroeconomic stabilizers because migrant workers are expected to substantially increase the amounts transferred to help family members in their countries of origin to compensate for the resulting drops in household income, whenever the economic activity in their country of origin slows down. This is according to World Bank (2006).

Remittances have also been relatively stable and exhibited resilience as compared to other capital flows especially during economic downturns as was observed during the most recent financial crisis. Between 2008 and 2009 remittances remained relatively steady and decreased by only 5.2%. Contrastingly, FDI in poor countries fell by a third during the crisis and portfolio inflows fell by more than half during the same period as shown by Ratha and Sirkeci (2010). The volatility dampening effect of remittances has also been observed to be larger in poorer countries where investment opportunities are pocket-sized and consumption needs are strong as depicted by

[1] Remittance data documented in World Bank reports takes into account summation of both personal transfers and compensation of employees. This is because some countries are not in a position to distinguish between the two aforementioned variables.

Bugamelli and Paterno (2011).

Within the spectrum of public finance, sovereign defaults are considered to be a recurring feature. They typically emanate from failure or refusal of the government of a sovereign state to repay its debt in full.[2] Cessation of outstanding amounts may either be accompanied by repudiation of a government not to pay (or only partially pay) its debts, or it may be unannounced. A default typically occurs when the government is in a vulnerable financial position owing to high debt service. This could be as a result of deterioration in economic fundamentals consequently leading to a negative change in creditor expectations and a sudden stop in capital flows follows. A number of studies suggest that a default is often associated with a decline in output growth. See, for instance, Panizza, Sturznegger and Zettelmeyer (2009). Generally, it is well acknowledged that defaults are costly because they are associated with penalty costs, reputational costs, international trade exclusion costs, and sometimes political costs to authorities. However, sovereign countries are not subject to normal bankruptcy laws and have the potential to escape responsibility for debts without legal consequences. We consider sovereign defaults to be a special type of negative shock because they are likely to be occasioned by limited resource availability to the sovereign, high borrowing costs as well as changes in political circumstances. Although empirical evidence does not suggest that a default necessarily closes off market access, it mentions an adverse effect on the government's cost of future borrowing as demonstrated by Borensztein and Panizza (2009).

Taking into consideration the fact that migration and remittances that emanate from such movements of people are substantially becoming an important aspect of the global economy, it is important to examine their impact. This issue is an important topic of analysis with respect to the significance of remittance flows towards developing economies. This also holds taking into consideration the relative stability of workers' remittances versus that of other inflows to developing countries. There exists a consensus that remittances provide additional macroeconomic benefits in terms of reduced volatility of output and smoothed consumption.

Our working hypothesis is that remittance flows, owing to their size and cyclical properties, can help to smooth consumption and investment in the aftermath of a sovereign default and in effect contribute to economic stability by virtue of increasing in volume. In this regard, the aim of this paper is to evaluate whether remittance flows remain steady or even increase in the aftermath of a sovereign default. We contribute to the literature in several ways because first, we conduct an analysis

[2]It is worth noting that the term default covers any change in the original debt contract resulting in a loss of value to the creditor, e. g. debt rescheduling.

for a large number of countries and a wide time-frame. Furthermore, this question has not yet been addressed since preponderance of literature on remittances has focused on output growth, financial sector development, poverty, real exchange rate appreciation and current account reversals.

Our analysis covers 81 countries over the period 1990-2010. The results obtained utilizing Paris Club data suggest that there exists a broad tendency for countries to receive an upsurge of remittance inflows after default episodes, therefore suggesting that remittance flows are particularly beneficial in the aftermath of a default. The results depicted by Paris Club Data are in line with our expectations because remittances heighten in the aftermath of sovereign default. We find that indeed the increment in remittances takes place at least two years after the occurrence of a sovereign default and thus plays a very important role to the recipient economy. To address biases due to reverse causality, we run regressions including lagging regressors one period by way of conducting Dynamic System Generalised Method of Moments (GMM) estimations. GMM estimation addresses endogeneity concerns by using lagged variables as instruments. We also implement fixed effects estimations taking into consideration both country and period fixed effects. Country fixed effects control for unobserved time-invariant country features. We base our conclusions on GMM estimations because GMM estimation results are more reliable owing to the fact that GMM estimators are known to be consistent, asymptotically normal, and efficient in the class of all estimators which are encompassed in the moment conditions.

The rest of this paper is organized as follows: Section 2 is devoted to a critical review of the related literature regarding sovereign defaults and remittances. Section 3 describes the econometric methodology and data sources. The same section also provides a thorough descriptive analysis of remittances and sovereign defaults. Section 4 introduces our empirical specifications whose base results are presented in section 5. In section 5, the link between remittances and sovereign defaults is also investigated as well as the robustness of our findings. Section 6 concludes the paper.

2 Related Literature

A massive amount of theoretical literature deals with the impact of remittances on recipient economies. Rapoport and Docquier (2006) for instance acknowledge altruism, exchange, inheritance, strategic motives, insurance and investment theories of remittance determination. Empirical evidence attest to the fact that remittances increase most when migrants' countries of origin experience some kind of macroe-

conomic shocks. To depict the aforementioned correlation, Yang (2008) employs a global dataset on hurricanes to show that remittances increase to countries that experience these natural disasters. Evaluating this within the wider spectrum of international financial flows, his findings reveal that for poorer countries, hurricanes lead to increase in migrant remittances. This is however contrary to the findings when richer countries are taken into account. The results show that the impact of hurricanes to some extent varies according to income level. Giulia et al. (2015) utilize data from Italian households to examine how international remittances are affected by macroeconomic conditions, structural characteristics and adverse shocks in recipient economies. They find a negative correlation between remittances and the business cycle as well as high increment in remittances in response to adverse exogenous shocks such as a large decline in terms of trade. According to their analysis, countercyclical remittances are mostly observed in migrant communities with a larger share of newly arrived migrants. The results partly support the theory behind altruism as a motive for remitting funds. David (2010) uses a multivariate dynamic panel analysis to evaluate the response of international financial flows to natural disasters, and the results show that remittance inflows surge significantly in response to shocks to both climatic and geological disasters. The results emanating from the study support the notion that remittance flows can play a hedging and compensatory role during episodes when the countries in the sample experience adverse shocks. Although a significant portion of remittance inflows is for altruistic reasons to support consumption and living standards of migrants' relatives, some of the migrants are also motivated to remit in order to benefit from monetary gains and take advantage of incentives offered in their home countries. Agarwal and Horowitz (2002) use multiple migrants households data to test altruism versus risk sharing motives and they give evidence supporting altruistic incentives while contrastingly, Lianos and Cavounidis (2010) argue that remittances depend on both altruism and risk sharing motives. This is with respect to experiences derived from immigrants to Greece. In their opinion, variations in migrant income may to some extent be borne by the migrants themselves rather than be mirrored in the remittance behaviour of households.

Chami, Fullenkamp, and Jahjah (2005) perform a panel regression estimation, and the results of the estimations reveal that the coefficients on the income gap variable are negative and highly significant. Consequently this provides strong cross-country evidence that remittances are better described as compensatory transfers.

It is widely acknowledged that remittance flows can be shock absorbers for the recipient economy and play a role in scaling down the country's vulnerability. In more

general terms, remittances can improve creditworthiness and as a result facilitate access to international capital markets based on the evaluation of Avendano, Guillard and Nieto-Parra (2011). According to proposition put forth, remittances not only smooth out current account deficits but also aggrandize international reserves which can be used to repay foreign debt. Bugamelli and Paterno (2009) suggest that remittances bolster financial stability by diminishing the probability of current account reversals. Using a large panel of emerging markets and developing economies, they find out that large, cheap, stable and low-cyclical flows of workers remittances reduce the probability of current account reversals in recipient countries. They use Instrumental Variables estimations to demonstrate the fact that the effect of remittances on current account reversals is causal in nature. Combes et al. (2014) provide a new insight by evaluating whether remittances and foreign aid hedge developing countries against food price shocks. The results show that aid and remittances are procyclical with respect to food price shocks. To add on that, it was evident that the response of remittances to such shocks is much higher. IMF (2005) hypothesizes that large, stable and low-cyclical inflows of remittances, which add up to the stock of international reserves can be used to repay sovereign debt and might significantly lessen the probability of financial crises in the face of worsening economic fundamentals. A significant and positive correlation is found between the level of remittances and credit ratings on sovereign debt. This therefore confirms empirical evidence that changes in remittance flows have a significant effect on credit ratings according to IMF (2005). World Bank documents that the inclusion of remittances in credit worthiness assessments greatly improves credit ratings done by Fitch, Moody's and S&P.

Comparing remittances to other capital flows, Buch and Kuckulenz (2010) postulate that remittances respond more to demographic variables while private capital flows respond more to macroeconomic conditions. De et al. (2016) examine the behaviour of remittances over the business cycle and their potential to act as a stabilizer during episodes of high business cycle volatility. According to their findings, remittances are relatively stable and acyclical. In contrast, FDI and debt flows exhibit procyclical patterns. The implication of their findings suggest that remittances can potentially critically support consumption in the face of economic adversity.

The finding that remittances facilitate financial development is confirmed in various cross-country studies. This is a pertinent link to consider because formal remittances which are accounted for are channeled through mainstream banks and financial institutions. Based on a dataset of 99 countries for the period 1975-2003, Aggarwal et al. (2006) find that remittances have a significant and positive impact on bank

deposits and on the ratio of credit to GDP. This is done because remittances increase aggregate level of deposits and credits. This result is also corroborated in a separate analysis by Gupta et al. (2009) who examine the influence of remittances on financial development on a panel of 44 Sub-Saharan Africa (SSA) countries from 1975 through to 2004 and provide the same evidence that remittances help in promoting financial development. The remittances-financial development link can be bidirectional relationship because on one hand, as mentioned by Orozco and Fedewa (2006), money transmitted through financial system paves way for remittances recipients to obtain other financial products which are offered by financial institutions. As a result, remittances can increase domestic credit if banks extend credit instruments to remittances recipients owing to the fact that remittances are perceived to be significant and stable. On the other hand, high financial development can increase remittance flows because better financial systems facilitate financial flows as highlighted by Aggarwal et al. (2011). Besides, well developed financial systems heighten remittance flows by reducing the cost of sending remittances.

With regard to business cycles, there is a tendency of remittances to move countercyclically with GDP in recipient countries. This is because migrant workers are expected to remit more during downturn of economic activities in their home countries. By so doing, they help their families to compensate for lost income due to adverse conditions like unemployment or other crisis-induced reasons. Sharp increases in remittance inflows after times of economic crisis, for example: Indonesia (1997), Ecuador (1999) and Argentina (2001), support this view that explains negative relationship between remittances and income. Sayan (2006) postulates that remittances reach peak of their own cycle within one year after a trough in the home country output. He suggests that the countercyclical nature of remittances enables these remitted funds to serve as a stabilizer that helps smooth out large fluctuations. The stabilizing impact of remittances has also been examined by various researchers. Chami et al. (2012) empirically examine the influence of remittances on macroeconomic volatility using a cross sectional data of 70 countries and their findings reveal that countries with high remittances to GDP ratios experience significantly lower macroeconomic volatility. Bugamelli and Paterno (2011) also perform a similar study and examine whether remittances reduce output volatility and they find evidence to the effect that indeed remittances have a stabilizing impact using a cross section of about 60 emerging and developing economies.

All the aforementioned review of literature deals with remittances and interactions with various macroeconomic variables. Focusing on defaults as in a recent study by Brandt and Jorra (2012), it is evident that foreign aid is not used as a punishment

instrument for a defaulting country. In essence, the overall amount of foreign aid given to the defaulting country increases by 6.4% after an occurrence of a sovereign default. This study augers well with our research because similarly, remittances like foreign aid increase in the aftermath of a sovereign default.

Tomz and Wright (2007) provide a long run analysis of the relationship between default and economic performance. The results postulate that there exists a high tendency for countries to default more often during periods of adverse economic conditions than during favorable conditions. It was noted that many inexcusable defaults occurred when political unrests brought new coalitions to power that favored default for opportunistic or ideological reasons. The latter study is also pertinent to our research because it points out to the fact that sovereign defaults are often an indicator of worsening economic fundamentals.

This paper intends to establish the linkage between remittances and sovereign defaults. By analyzing the stabilizing impact of remittances after sovereign default, this paper examines an unexplored potential determinant of economic stability. To add on that, it also investigates a new channel through which remittances can affect economic stability.

3 Data and Descriptive Evidence

This section outlines sources and methods used to construct a database of sovereign default and remittances. We base our empirical analysis on a panel of 81 developing countries with annual data from 1990 to 2010. Country coverage is dictated by data availability on main variables of interest, in particular remittances and default. As part of robustness checks, we further restrict the sample by excluding former communist countries, taking into account data from 1990-2008 to evaluate the impact of the global financial crisis, excluding outliers, and further still by using regional dummies as regressors. We measure remittances as a ratio to population thus remittances are expressed in million USD per capita. We derive remittance series from the World Bank Database (World Bank Indicators).

We use official population series to convert total remittances to a per capita series in order to compare remittance receipts given different country sizes.[3] It is worth noting that gathering data on remittances is prone to measurement error since the data usually underestimates the true remittance flows because remittances data captures funds that flow through official channels, yet there is still more funds remitted

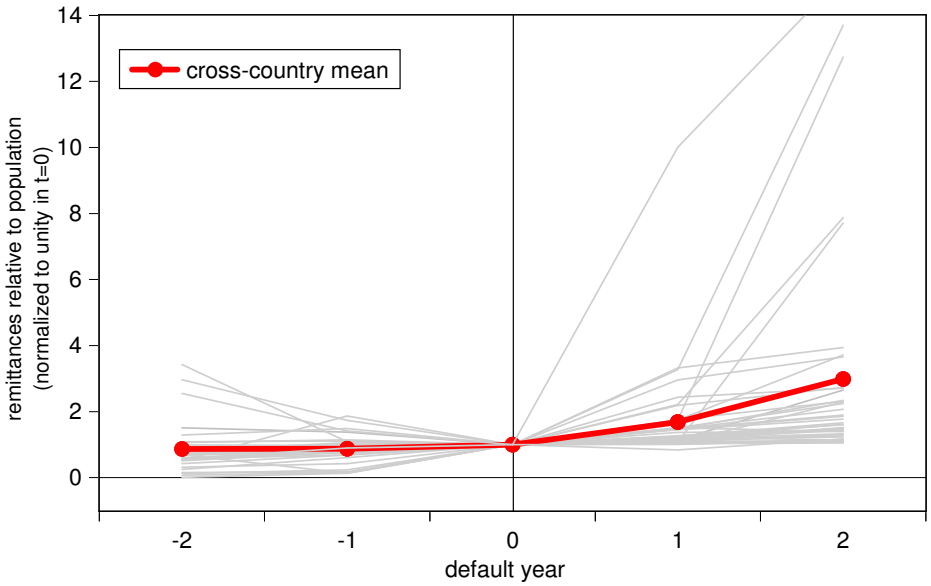
[3]Dividing remittances by population to obtain per capita series allows neutralizing effects of variation in country sizes among our sample.

through private channels which go unrecorded.

To begin with, we display visual data from defaulting countries by way of graphically illustrating pre and post default behaviour of remittances as shown in Figure (1). The graph shows five years of data whereby remittances data is normalized to one and then graphically represented two years before and two years after the year of default occurrence. The graphical representation shows that there is a tendency of remittances to increase after default episodes as depicted by the upward sloping line graphs after time zero which denotes the actual year of default. The data depicts remittances-default nexus pre and post default episode and shows that remittances pick up two years after the year of default occurrence.

Next, we examine these patterns to establish whether they hold up more systematically over a large sample of countries cutting across different continents. The graph also shows an average line graph depicting the average remittances trend of all the countries used in this study. Mean in t=2 is 1.98 points higher than in t=0. The steep line graph represents Madagascar which experienced a huge leap in remittance inflows after experiencing sovereign default in 2004. The high margin of remittance inflows from 29 million USD in 2004 to 115 million USD in 2005 and a further increment to 175 million USD account for the steep uppermost graph in Figure 1. In chapter 5, the three outlier countries (Madagascar, Rwanda and Guinea) are excluded to assess the robustness of our findings.

Figure 1: **Remittance inflows pre and post default**



Notes : Year of default is normalized to zero. The figure shows a window of plus and minus two years around a default. The flows have been normalized to one in the year of default.

Consistent with much of the literature on sovereign defaults according to Cruces and Trebesch (2013), and the practice of credit rating agencies as detailed out by Beers and Chambers (2006), it is often considered that a default has occurred when debt service is not paid on the due date (or within a specified grace period of time), payments are not made within the time frame specified under a guarantee, or alternatively, absent an outright payment default. Sometimes credit rating agencies also consider a "technical" default an episode in which the sovereign makes a restructuring offer that contains less favorable terms than the original debt. It should be noted that sovereign defaults do not necessarily imply total repudiation of outstanding debt. In most cases, default episodes are usually followed by a settlement between creditor and debtor although sometimes it may take the form of a debt exchange or debt restructuring. The new stream of payments normally involves a combination of lower principal, lower interest payments and longer maturities.
This study carries out regressions taking into account two default measures namely Paris Club (Paris Club website) and CT defaults (Cruces and Trebesch, 2013) as detailed out by Cruces and Trebesch. The former definition of sovereign default refers to the renegotiation of official external debt through the Paris Club. We follow Fuentes and Saravia (2010), Martinez and Sandleris (2011) and Brand and

Jorra (2012) in using information from the Paris Club (2011) to construct different indicators of sovereign defaults. Each default episode correspondingly reflects either postponement or an outright reduction of a country's debt service obligations owed to other sovereign countries. Paris Club's website is the most comprehensive data source on sovereign defaults in terms of coverage and detail. Essentially, it comprises more than 400 debt restructurings that took place between 1956 and 2010. For each restructuring deal, there is information regarding the amount of debt rescheduled and the type of treatment and as a result specifying degree of concessionality.

On the other hand, CT default episodes take into account distressed sovereign debt restructurings with external private creditors (foreign commercial banks as well as foreign bondholders). In this study, we consider both absolute values in original metric and dummies of both default measures in order to test for robustness. Sovereign defaults typically coincide with periods of economic hardship which renders the crisis-stricken countries more needy. In principal, we expect a positive sign coefficient basing the results on the premise that when countries default, migrants are meant to view it as a form of crisis or poor economic performance thus remit more funds to cater for the well being of their family members back in their home countries.

Another important variable of interest is population. Growth in population implies a corresponding increase in the number of citizens crossing borders for greener pastures into another country. As a consequence, an upsurge of remittances goes hand in hand with cross-border migration that is increasingly symptomatic of the demographic shifts. Data on population is obtained from Penn World Table 8.1. Use of population data also facilitates comparison of remittance receipts given the variant country sizes in our sample.

The exchange rate also matters because it is expected that remitters take into account the value of domestic currency when they remit. An appreciation of the domestic currency (remittance recipient country's currency) is likely to reduce the remittance proportion because it presents a form of extra cost for the remitter. The converse therefore holds true since depreciation of domestic currency appears cheaper to the migrants therefore leading to increased inward remittances. Data on exchange rates is represented as the value of local national currency in terms of USD for a period in national currency.

The human capital index measures countries' ability to maximize and leverage their human capital endowment. Human capital in terms of education, skills, knowledge, age and health determines access to economic opportunities. Individual human capital has been seen as a key determinant of migration probability and it has also

been established that those with better education and skills have a comparative advantage in destination labour markets and are more likely to migrate. When better educated people emigrate, they earn more abroad and the resultant effect is more remittances to their home countries because they can afford to send more money back home.

Political stability and absence of violence index portrays political stability and absence of violence as the name suggests. This estimate is obtained from World Governance Indicators and it gives the country's score on the aggregate indicator in units of a standard normal distribution. Better political structures allow for implementation of various strategies and that spurs on remittance flows.

Other variables of interest are GDP growth and GDP per capita. Low income countries are expected to receive relatively more remittances than high income countries thus GDP per capita is negatively related to remittances. On the other hand, GDP growth depicts the business cycle of the recipient country. Therefore, GDP growth could either be positively or negatively related to remittance inflows depending on the motive for remittance.

Natural disasters data is drawn from the Centre for Research on the Epidemiology of Disasters (CRED), Emergency Events Database (EM-DAT). We take into account the top 10 disasters with the largest number of casualties.[4] Migrants are presumed to be empathetic therefore they look for means of bailing out their relatives back home by remitting more whenever a huge disaster hits their home country.

Household consumption spending is mostly influenced by the amount of income available to the households. Since remittances are meant to be a form of income shock, they are expected to positively influence the consumption patterns of the recipient household since their ability to spend is increased. Previous studies also point out to the fact that remittances have a smoothing effect on consumption instability. Consumption instability is driven by a complex array of factors including economic shocks, the determinants of household elasticity with respect to shocks and the determinants of household consumption elasticity with respect to household income. Since remittances affect all the aforementioned factors, they are considered to play a pertinent role in stabilization of household consumption.

OECD countries seem to be the ideal destination countries for most migrants from developing countries thus economic growth in OECD countries implies that migrants will be in a position to earn more and as a result remit more to their countries of origin. Since variations in remittances is somehow influenced by economic condi-

[4]The sum of people affected and killed is used as an indicator of magnitude of a natural disaster. Therefore we consider ten of the highest magnitudes exhibited.

tions of the migrants' host countries, the OECD growth rate is also included as an additional regressor. Economic conditions in migrants' host countries are likely to affect the volume of remittance flows that migrants are able to send.
We use lagged values of various control variables that may influence the inflow of remittances in order to address the problem of endogeneity. A comprehensive list of countries and descriptive statistics of all the variables used in this study are presented in the appendix.[5]

4 Econometric Framework

We empirically examine the relationship between remittances and defaults using the following model:

$$log\left(\frac{Rem_{i,t}}{Pop_{i,t}}\right) = \beta_0 D_{i,t-1} + \beta_1 X'_{i,t-1} + \varepsilon_{i,t},$$

where i refers to country and t refers to the time period from 1990 to 2010. However, data for the entire time period is not available for all countries therefore we only include countries if at least six years of data are available. Rem refers to remittances while Pop refers to population, therefore the log of the ratio of remittances to population is in this case our dependent variable which depicts respective countries' reliance on remittances. The matrix $X'_{i,t}$ is a matrix of control variables that the literature has found to affect remittances and D is the indicator of default. We scale the size of default by population to correspond with the treatment of the dependent variable. β_1 is a vector which includes coefficients on the control variables. β_0 is the coefficient of primary interest and the error term is denoted as $\varepsilon_{i,t}$.
The vector of standard control variables includes various other variables as follows: GDP growth is taken into account because it shows the business cycle of the recipient countries. Remittance trend of remitters could be quite ambiguous in the sense that remittances may be countercyclical or procyclical depending on the motive behind remittance flows. Remitters may want to remit more during economic downturn in their home countries as a form of lending a hand or more still willing to remit larger sums when the country is on a robust growth path taking advantage of investment opportunities. We use lagged values of default measures in order to limit endogeneity. Lagged values also capture the effect of delayed response of remittances in the

[5]Comprehensive definition of variables, sources of data and descriptive statistics are presented in the Appendix.

aftermath of a sovereign default because remittances do not respond in real time hence a time lapse lasting approximately a year.

We also use lagged values of the natural logarithm of the exchange rate to bring out the effect that exchange rate movements in the preceding year influence remittances in the current period. This is also explained by the fact that the exchange rate is endogenous. We also use lagged values of the natural logarithm of GDP per capita as well as disaster dummies since these are considered part of the regressors which influence the magnitude of remittances. OECD growth rate, human capital index and political stability and absence of violence index are also potential candidates that impact on the flow of remittances. Growth in household consumption may also influence the magnitude of remittance flows into the recipient economy whereby higher household consumption may be associated with higher remittances.

The most outstanding problem is that the regressors are not strictly exogenous. We therefore follow Ebeke and Combes (2013) by including lagged variables as opposed to current realizations of most control variables.[6] This should mitigate endogeneity concerns. System GMM estimator allows for use of lagged differences and lagged levels of the explanatory variables as instruments as illustrated by Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998). The GMM estimations generally control for endogeneity of remittances and other explanatory variables. In this case, there is one specification test that checks the validity of the instruments. This is the standard Hansen test of over-identifying restrictions which is based on the assumption that model parameters are identified via a priori restrictions on the coefficients and hence tests the validity of over-identifying restrictions. The null hypothesis is that the over-identifying restrictions are valid.

If remittances increase when the recipient economy defaults, estimation of the remittance impact by (OLS) is biased. Moreover the OLS estimator is inconsistent since the lagged dependent variable is introduced besides country fixed-effects. However, we carry out both GMM and fixed effects estimations in deriving initial baseline results.[7] We apply the Windmeijer finite sample correction to standard errors in our GMM estimations in order to mitigate downward bias.

[6]GMM estimations takes into account lagged endogenous variables which are not captured when fixed effects estimations are carried out.

[7]The main estimation method in this paper is Dynamic System GMM developed by Blundell and Bond (1998). Fixed effects estimator is inconsistent in the presence of regressors that satisfy contemporaneous but not strict exogeneity and is also considered to be downward biased.

5 Empirical Evidence on the Role of Remittances

5.1 Baseline Results

In order to address the issue of endogeneity in remittances data due to reverse causality, we initially conduct estimations lagging remittances per capita and other regressors a maximum of four periods when we perform dynamic system GMM estimations where we use lags of regressors as instruments.[8]

We follow Arellano and Bover (1995) and Blundell and Bond (1998) in carrying out GMM estimations. We run regressions using the one-step GMM estimator. The main exogenous variables taken into consideration in this case include: OECD growth, political stability, default and disasters. Endogenous variables consist of human capital index, GDP growth, log of GDP per capita, household consumption growth and log of exchange rate. Table 2 contains estimation results from GMM estimations whereby the results derived from Paris Club yield the expected sign and are statistically significant thus supporting the hypothesis that remittances significantly increase in the aftermath of sovereign default and as such play a stabilizing role in the recipient economies. A country suffering a default experiences, on average, an increase in per-capita remittances of 0.24%.

Our GMM estimation results also display the Hansen J test of overidentifying restrictions. According to the Hansen J test statistics results, it is quite evident from the values obtained that the instruments are uncorrelated with the error term and that excluded instruments are correctly excluded from the estimated equation. Hansen's J statistic does not reject the null hypothesis that our instruments are valid. This test thus confirms the validity of our instruments because it confirms that our instrument set is appropriate. In all our results we display z-statistics. Z-test is a statistical procedure used to test an alternative hypothesis. This statistical test is constructed using z-score which describes how much a point deviates from the mean. A positive z-score implies that the data value is larger than the mean whereas a negative z-score means that the data value is smaller than the mean. The z-statistics results obtained lie within the acceptable range.

<< insert table 2 here >>

GMM approach is superior to fixed effects estimations because the OLS estimator is inconsistent, therefore a lagged dependent variable is introduced besides country fixed effects. However, measurement error is known to beset the balance of pay-

[8]To address the problem of endogeneity as well as instrument proliferation raised by the GMM estimator, our matrix of instruments takes into account a maximum of four lags.

ments statistics thus likely to bias our estimates. Biases might also occur because of common omitted variables driving the behaviour of remittances and sovereign defaults. As a result, measurement error seems to be a persistent problem that cannot be completely eliminated because even though GMM approach is used, they cannot correct for biases arising from measurement error.

In our second approach, we examine the relationship between remittances and sovereign defaults by running fixed effects regressions. In this instance we ignore potential biases due to measurement error, omitted factors or reverse causation. We use fixed effects because there's high likelihood that unobserved characteristics of remittance recipient countries characteristics correlate with variables of interest. However, in fixed effects regressions the variable $\Delta OECD$ is omitted because the model already takes into account period and country specific characteristics and therefore inclusion of $\Delta OECD$ leads to syntax error.

<< insert table 3 here >>

Table 3 represents fixed effects estimations assuming that remittances are exogenous and adequately measured. The adjusted R^2 value which amounts to 0.84 depicts that the model's explanatory power is very strong. We find that defaults have a positive sign when Paris Club data is used as a default measure. The results also depict that whenever default occurs, then it is expected that the level of remittances will significantly rise. This finding of a positive coefficient when Paris Club data is used confirms our notion that increment in remittances emanate from sovereign defaults episodes and thus play a central role in dampening the negative effects of a default. The coefficient on CT default has the correct sign but is not statistically significant. Regarding GDP growth, we find mixed evidence in favour of the hypothesis that migrants respond to GDP growth fluctuations in their home countries because apparently this entirely depends on the motive of remittance. On the one hand, taking into consideration altruistic motive, migrants would remit funds when the economic fundamentals in their home countries worsen. On the other hand migrants who are motivated by favorable investment climate would remit during periods in time whereby the economy is performing well and take advantage of the prevailing investment opportunities.

The Paris Club data is deemed to be superior to other forms of default data owing to the fact that the case selection and data collection for the Paris Club dataset is straightforward. Moreover, it includes all bilateral debt restructurings under the chairmanship of the Paris Club. On the flip side, CT criteria for default selection tend to be limited in scope because the main attention is drawn to five criteria which

include: only distressed restructurings, only restructurings with foreign private creditors, no agreements on short-term debt, only public debt restructurings and only finalized deals. As a result, we rely on the results exhibited when Paris Club data is taken into account and therefore base our conclusions and recommendations on the same.

5.2 Further Robustness Exercises

To verify the robustness of the GMM results obtained thus far we conduct a number of additional estimations. Firstly, we exclude former communist countries because of the negative impact of totalitarian control of the economy which hindered free movement of capital thus inhibited remittance inflows. Secondly, we control for the global financial crisis effect by taking into account only data ranging from 1990-2008. Thirdly, to account for the presence of outliers, we drop observations for Madagascar, Rwanda and Guinea. Fourthly, we introduce regional dummies to prove that remittances per capita is not significantly higher in one region of the world but in actual sense distributed across a wide range of developing countries in various parts of the world.

Taking into consideration the first robustness exercise, exclusion of former communist countries slightly alters our estimations results. The coefficient on default measure increases by a margin of about 0.04%. Our results prove that indeed the impact of remittances is felt to a greater extent in the aftermath of a sovereign default and this effect cuts across a wide range of developing countries. This is evidenced by the results shown on table 4.

<< insert table 4 here >>

Next we estimate the regression equation using data from 1990-2008 to analyze whether the global financial crisis affected our initial results. Significant variation of remittance flows seems plausible given the fact that our sample includes the financial crisis period between 2008 and 2009. In like manner, estimates for 1990-2008 also yield estimation results similar to those encompassing the overall period. The coefficient of 0.25% is slightly higher than the overall coefficient and it is significant at the 1% level. We find that our estimation results are robust in the sense that even during the global financial crisis period, remittance flows contributed to stability. This is also evident from the fact that the overall coefficient captures the global financial crisis phase, a period during which many capital flows plummeted but remittances exhibited resilience.

<< insert table 6 here >>

Excluding outliers does not change our results in any significant way. Table 7 shows that both the significance and magnitude of remittances as well as the number of defaults remain unchanged when we drop observations associated with the three outliers composed of observations for Madagascar, Rwanda and Guinea. Defaults continue to have a positive effect on remittances per capita as before. Paris Club data in both original metric and the coefficient on the default dummy yield significant results. In principle, the absolute value (original metric) of default measurement is more accurate as compared to the use of dummy variables. In this case, our estimation results hold taking into account both definitions thus highly supporting the notion that remittances significantly increase in the aftermath of a sovereign default with respect to a wide range of developing countries. Dummy variables are deemed to be "artificial" variables and as such run the risk of picking up specification errors from omitted variables. In light of the foregoing explanation highlighting the dummy variables setback, we base our conclusions on the results yielded by the absolute value default measure when conducting this form of robustness check.[9] In the table below, the three outlier countries (Madagascar, Rwanda and Guinea) are excluded to assess the robustness of our findings.

<< insert table 7 here >>

Finally we rerun GMM estimations including regional dummies. To sum it up, inclusion of regional dummies paves way for us to prove that our results hold for all regions worldwide since the results depict that remittances per capita is not significantly higher in one region of the world. According to the estimates on table 8, it is evident that all countries included in the sample which represent different continental groups collectively contribute to the overall results.

<< insert table 8 here >>

[9]The fact that some default dummy results are not significant does not contrast our general conclusions. Similar results can be obtained by using fixed effects estimations. These results are available from the author upon request.

6 Conclusions

The role of remittances in a broader developmental context continues to be an interesting topic for many researchers. This paper uses a dynamic system panel GMM estimator for a large set of countries, alternative default definitions and standard control variables to examine the role of remittances in the aftermath of sovereign defaults with respect to developing countries. In this research, special focus is on the bolstering nature of remittances in the aftermath of a sovereign default. To the best of our knowledge, we are the first ones who empirically investigate the validity of the assumption that sovereign defaults lead to an upsurge of remittance flows to defaulting countries.

Using data from a wide range of developing countries and carrying out GMM estimations yield results which indicate that occurrence of a default triggers an upsurge of remittances to defaulting countries. This is mainly because migrants associate default episodes with periods of economic hardships in their countries of origin and therefore decide to remit more as a form of financial safety net for their relatives to dampen possible volatility in consumption patterns. This increase is statistically significant, leading us to conclude that indeed remittances play a pertinent role in the aftermath of a sovereign default. Drawing inferences from our results, an increase of 0.24% in remittances per capita occurs in the aftermath of a sovereign default. Our findings are robust to different empirical model specifications and a variety of robustness checks. Evaluating our findings with respect to economic significance of the results, it is evident that the recipient households are likely to be cushioned against the worsening economic fundamentals of the sovereign state in default. Consequently, our findings confirm yet another channel through which remittances promote stability in developing countries. However, it is worth noting that migrants remit for different reasons that also depend on individual migrant's characteristics in addition to both the host and country of origin characteristics.

The findings of this paper also entail several policy implications. Given the stabilizing nature of remittances, developing countries susceptible to sovereign defaults are likely to benefit from fostering these flows through various means, for example, pursuing policies that reduce transaction costs associated with international remittances. It would also be important to reduce impediments to remittances by doing away with multiple exchange rate regimes and avoiding taxation of remittances. Furthermore, governments should be encouraged to pay external debt to avoid all the negative consequences associated with sovereign defaults thus facilitate utilization of remittances for additional developmental benefits in the recipient economies. Regarding default episodes, countries should avoid defaults at all costs because on

this basis, increased remittances ought to bring about more general stability to the international economy.

Based on the stylized facts presented in this paper, we conclude that remittances might have stabilizing features after episodes of sovereign defaults. This contributes to literature revolving around the role of remittances in hedging recipient economies against macroeconomic instability such as natural disaster, exchange rate instability, systemic banking crisis, discretionary fiscal policy and agricultural shocks. The findings provided in this paper therefore provide additional evidence of the beneficial effects of remittances.

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Table 1: Summary statistics

Variables	Observations	Mean	Std. Dev.	Maximum	Minimum
$log(Rem/Pop)$	1701	2.8919	2.9188	9.5115	-4.3553
$ParisDefault$	1701	194.28	1704.9	37158	0.0000
$CTDefault$	1701	205.24	2509.9	60572	0.0000
$ParisDummy$	1701	0.1287	0.3350	1.0000	0.0000
$CTDummy$	1701	0.0400	0.1960	1.0000	0.0000
ΔGDP	1693	3.7476	8.0680	106.28	-66.120
$lnXr$	1701	3.4640	3.6044	9.8316	-26.204
$lnGDPpc$	1701	7.8020	1.6093	10.388	-3.6026
$disasters$	1701	0.3228	0.4677	1.0000	0.0000
HCI	1323	2.1734	0.5392	3.2762	1.1286
$PoliticalS$	1701	-0.4926	0.8479	1.2059	-3.1848
$\Delta cons$	1701	541.49	352.35	1266	1.0000
$\Delta OECD$	1701	-0.0383	2.0101	6.5224	-3.7751
$AF\ dummy$	1701	0.4568	0.4983	1.0000	0.0000
$LAC\ dummy$	1701	0.2716	0.4449	1.0000	0.0000
$EU\ dummy$	1701	0.1235	0.3291	1.0000	0.0000
$ME\ dummy$	1701	0.0494	0.2167	1.0000	0.0000
$AS\ dummy$	1701	0.0988	0.2984	1.0000	0.0000

Notes: We derive the variables displayed from various sources and in certain occasions transform them in order to facilitate our analysis.

Table 2: Baseline Results (GMM)

GMM Results				
Variables	*ParisDefault*	*ParisDummy*	*CTDefault*	*CTDummy*
Dependent Variable : $\log\left(\frac{Rem}{Pop}\right)$				
default/Pop	2.43		-0.05	
($\times 10^{-3}$)	[2.59]**		[−0.19]	
default dummy		0.33		-0.02
		[1.89]*		[−0.08]
lnXr	0.62	0.60	0.66	0.68
($\times 10^{-1}$)	[0.58]	[0.56]	[0.63]	[0.64]
ΔGDP	0.21	0.31	0.18	0.24
($\times 10^{-2}$)	[0.05]	[0.07]	[0.04]	[0.06]
lnGDPpc	-0.38	-0.36	-0.31	-0.32
	[−1.71]*	[−1.71]*	[−1.53]	[−1.57]
disasters	0.03	0.05	0.03	0.04
	[0.24]	[0.40]	[0.21]	[0.27]
Δ*cons*	-2.32	-2.48	-2.24	-2.35
($\times 10^{-4}$)	[−0.31]	[−0.34]	[−0.30]	[−0.31]
HCI	1.66	1.61	1.45	1.48
	[1.95]*	[1.88]*	[1.76]*	[1.78]*
PoliticalS	0.09	0.11	0.13	0.12
	[0.38]	[0.51]	[0.57]	[0.54]
△*OECD*	0.35	0.37	0.34	0.33
($\times 10^{-2}$)	[0.16]	[0.18]	[0.16]	[0.16]
No. of Countries	81	81	81	81
No. of Observations	1260	1260	1260	1260
Hansen test	0.683	0.704	0.590	0.563

Notes: Absolute values of z statistics are in brackets. The symbols *, ** and *** denote significance at 10%, 5% and 1% level respectively.

Table 3: Baseline Results (Fixed Effects)

Fixed Effects Results				
Variables	*ParisDefault*	*ParisDummy*	*CTDefault*	*CTDummy*
Dependent Variable : $\log\left(\frac{Rem}{Pop}\right)$				
default/Pop	0.42		0.01	
($\times 10^{-3}$)	[2.02]**		[0.04]	
default dummy		0.37		-0.85
($\times 10^{-2}$)		[0.05]		[−0.06]
lnXr	0.20	0.20	0.20	0.20
	[2.32]**	[2.34]**	[2.33]**	[2.34]**
ΔGDP	0.02	0.02	0.02	0.02
	[2.16]**	[2.27]**	[2.30]**	[2.30]**
lnGDPpc	-0.08	-0.07	-0.07	-0.07
	[−0.30]	[−0.27]	[−0.27]	[−0.27]
disasters	-0.02	-0.02	-0.02	-0.02
	[−0.39]	[−0.37]	[−0.37]	[−0.38]
Δ*cons*	0.01	0.01	0.01	0.01
	[1.31]	[1.23]	[1.23]	[1.22]
HCI	-4.18	-4.21	-4.21	-4.21
	[−8.20]***	[−8.33]***	[−8.46]***	[−8.36]***
PoliticalS	-0.04	-0.05	-0.05	-0.05
	[−0.34]	[−0.36]	[−0.37]	[−0.36]
No. of Countries	81	81	81	81
Adjusted R^2	0.84	0.84	0.84	0.84
No. of observations	904	904	904	904

Notes: Absolute values of t statistics are in brackets. The symbols *, ** and *** denote significance at 10%, 5% and 1% level respectively.

Table 4: Excluding transition countries (GMM)

GMM Results				
Variables	*ParisDefault*	*ParisDummy*	*CTDefault*	*CTDummy*
Dependent Variable : $\log\left(\frac{Rem}{Pop}\right)$				
default/Pop	2.82		0.01	
($\times 10^{-3}$)	[3.61]***		[0.41]	
default dummy		3.33		3.62
($\times 10^{-2}$)		[1.80]*		[0.16]
lnXr	-0.06	-0.13	-0.18	-0.14
($\times 10^{-1}$)	[−0.06]	[−0.13]	[−0.18]	[−0.14]
ΔGDP	-5.73	-0.56	-0.02	-0.44
($\times 10^{-3}$)	[−0.21]	[−0.02]	[−0.00]	[−0.02]
lnGDPpc	-0.17	-0.12	-0.05	-0.06
	[−0.52]	[−0.40]	[−0.17]	[−0.21]
disasters	-0.08	-0.05	-0.05	-0.04
	[−0.64]	[−0.33]	[−0.32]	[−0.29]
Δ*cons*	1.99	2.69	3.33	3.25
($\times 10^{-4}$)	[0.30]	[0.38]	[0.44]	[0.43]
HCI	1.04	0.84	0.59	0.63
	[0.90]	[0.74]	[0.53]	[0.55]
PoliticalS	0.12	0.12	0.13	0.13
	[0.39]	[0.45]	[0.46]	[0.45]
$\triangle OECD$	0.63	0.04	-0.13	-0.11
($\times 10^{-4}$)	[0.42]	[0.02]	[−0.07]	[−0.06]
No. of Countries	62	62	62	62
No. of Observations	960	960	960	960
Hansen test	0.965	0.949	0.980	0.973

Notes: Absolute values of z statistics are in brackets. The symbols *, ** and *** denote significance at 10%, 5% and 1% level respectively. In this regression, 19 former communist countries are excluded thus decreasing the sample size from 81 to 62 countries.

Table 5: Excluding transition countries (Fixed Effects)

Fixed Effects Results				
Variables	*ParisDefault*	*ParisDummy*	*CTDefault*	*CTDummy*
Dependent Variable : $\log\left(\frac{Rem}{Pop}\right)$				
default/Pop	0.39		-0.02	
($\times 10^{-3}$)	[1.86]*		[−0.11]	
default dummy		-0.07		0.01
		[−0.88]		[0.07]
lnXr	0.07	0.07	0.07	0.07
	[1.77]*	[1.86]*	[1.80]*	[1.81]*
ΔGDP	0.69	0.09	0.08	0.08
($\times 10^{-1}$)	[0.64]	[0.81]	[0.75]	[0.74]
lnGDPpc	-1.02	-1.02	-1.02	-1.02
	[−3.97]*	[−4.32]***	[−4.17]***	[−4.01]**
disasters	-0.08	-0.07	-0.07	-0.07
	[−1.27]	[−1.24]	[−1.24]	[−1.25]
Δ*cons*	0.01	0.01	0.01	0.01
($\times 10^{-1}$)	[0.21]	[0.11]	[0.12]	[0.12]
HCI	-2.76	-2.80	-2.80	-2.79
	[−5.44]***	[−5.53]***	[−5.65]***	[−5.62]***
PoliticalS	0.15	0.14	0.15	0.15
	[1.03]	[1.01]	[1.01]	[1.00]
No. of Countries	62	62	62	62
Adjusted R^2	0.86	0.86	0.86	0.86
No. of Observations	699	699	699	699

Notes: Absolute values of t statistics are in brackets. The symbols *, ** and *** denote significance at 10%, 5% and 1% level respectively. In this regression, 19 former communist countries are excluded thus decreasing the sample size from 81 to 62 countries.

Table 6: Pre-crisis sample (GMM)

GMM Results				
Variables	*ParisDefault*	*ParisDummy*	*CTDefault*	*CTDummy*
Dependent Variable : $\log\left(\frac{Rem}{Pop}\right)$				
default/Pop	24.73		7.92	
($\times 10^{-4}$)	[2.61]***		[0.63]	
default dummy		0.34		-0.01
		[1.82]*		[−0.07]
lnXr	0.06	0.05	0.12	0.06
	[0.51]	[0.49]	[1.04]	[0.56]
ΔGDP	-0.08	0.07	-0.10	-0.03
($\times 10^{-2}$)	[−0.02]	[0.02]	[−0.42]	[−0.01]
lnGDPpc	-0.39	-0.36	-0.31	-0.32
[−1.59]	[−1.59]	[−1.39]	[−1.42]	
disasters	0.04	0.06	0.04	0.04
	[0.26]	[0.40]	[0.25]	[0.30]
Δ*cons*	-3.14	-2.96	-2.82	-2.93
($\times 10^{-4}$)	[−0.38]	[−0.36]	[−0.33]	[−0.34]
HCI	1.68	1.61	1.43	1.45
	[1.87]*	[1.81]*	[1.67]*	[1.69]*
PoliticalS	0.06	0.08	0.10	0.10
	[0.22]	[0.35]	[0.41]	[0.39]
$\triangle OECD$	0.15	0.18	0.17	0.16
($\times 10^{-1}$)	[0.38]	[0.43]	[0.41]	[0.40]
No. of Countries	81	81	81	81
No. of Observations	1134	1134	1134	1134
Hansen test	0.509	0.515	0.453	0.483

Notes: Absolute values of z statistics are in brackets. The symbols *, ** and *** denote significance at 10%, 5% and 1% level respectively. This regression takes into account only data from 1990-2008 to evaluate the effect of the 2008-2009 global financial crisis.

Table 7: Excluding outliers (GMM)

GMM Results excluding outliers				
Variables	*ParisDefault*	*ParisDummy*	*CTDefault*	*CTDummy*
Dependent Variable : $\log\left(\frac{Rem}{Pop}\right)$				
default/Pop	26.28		-1.46	
($\times 10^{-4}$)	[3.79]***		[−0.57]	
default dummy		0.40		-0.10
		[2.72]***		[−0.44]
lnXr	-0.03	-0.04	-0.03	-0.03
	[−0.61]	[−0.69]	[−0.52]	[−0.51]
ΔGDP	-3.90	-0.37	-0.39	-0.40
($\times 10^{-1}$)	[−1.32]	[−1.28]	[−1.33]	[−1.33]
lnGDPpc	-0.25	-0.19	-0.16	-0.17
	[−1.16]	[−0.88]	[−0.74]	[−0.75]
disasters	0.08	0.09	0.07	0.07
	[0.62]	[0.70]	[0.53]	[0.54]
Δ*cons*	5.11	4.79	5.57	5.54
($\times 10^{-4}$)	[1.50]	[1.43]	[1.61]	[1.59]
HCI	0.94	0.77	0.66	0.67
	[1.28]	[1.04]	[0.88]	[0.89]
PoliticalS	-0.08	-0.04	-0.03	-0.04
	[−0.69]	[−0.38]	[−0.30]	[−0.33]
△*OECD*	0.19	0.20	0.18	0.18
($\times 10^{-1}$)	[1.06]	[1.10]	[1.05]	[1.05]
No. of Countries	78	78	78	78
No. of Observations	1240	1240	1240	1240
Hansen test	0.745	0.736	0.763	0.696

Notes: Absolute values of z statistics are in brackets. The symbols *, ** and *** denote significance at 10%, 5% and 1% level respectively. In this case we exclude three outliers in our dataset which are Madagascar, Rwanda and Guinea.

Table 8: Including regional dummies (GMM)

GMM Results including regional dummies				
Variables	*ParisDefault*	*ParisDummy*	*CTDefault*	*CTDummy*
Dependent Variable : $\log\left(\frac{Rem}{Pop}\right)$				
default/Pop	23.28		7.92	
$(\times 10^{-4})$	[2.67]***		[0.63]	
default dummy		1.09		1.45
		[1.69]*		[2.03]*
lnXr	0.04	0.04	0.12	0.09
	[0.37]	[0.30]	[1.04]	[0.60]
ΔGDP	0.04	0.19	-0.10	-0.08
$(\times 10^{-1})$	[0.09]	[0.43]	[−0.42]	[−0.20]
lnGDPpc	-0.46	-0.43	-0.15	-0.24
	[−1.26]	[−1.15]	[−0.32]	[−0.51]
disasters	-0.02	0.01	-0.04	0.01
	[−0.19]	[0.06]	[−0.49]	[0.09]
Δ*cons*	-3.13	-3.93	-4.27	-4.68
$(\times 10^{-4})$	[−0.42]	[−0.57]	[−0.97]	[−0.66]
HCI	1.83	1.81	1.28	1.25
	[1.47]	[1.51]	[1.02]	[0.87]
PoliticalS	0.23	0.25	0.31	0.26
	[1.28]	[1.30]	[1.62]	[1.52]
$\triangle OECD$	0.30	0.15	0.49	0.48
$(\times 10^{-2})$	[0.14]	[0.07]	[0.25]	[0.22]
AF dummy	0.85	0.60	-0.22	0.32
	[1.05]	[0.68]	[−0.19]	[0.32]
LAC dummy	0.63	0.52	-0.10	0.35
	[0.76]	[0.54]	[−0.08]	[0.34]
ME dummy	0.86	0.67	-0.20	0.38
	[0.86]	[0.62]	[−0.12]	[0.28]
AS dummy	0.29	0.09	-0.84	-0.15
	[0.46]	[0.15]	[−0.87]	[−0.20]
No. of Countries	81	81	81	81
No. of Observations	1260	1260	1260	1260
Hansen test	0.689	0.871	0.852	0.849

Notes: Absolute values of z statistics are in brackets. The symbols *, ** and *** denote significance at 10%, 5% and 1% level respectively. The estimation results display various regional dummies categorized according to continents i.e Africa (AF), Latin America and Caribbean (LAC), Europe (EU), Middle East (ME) and Asia (AS).

A Country Coverage

Albania	Croatia	Jamaica	Rwanda
Angola	DR Congo	Jordan	Sao Tome and Principe
Antigua and Barbuda	Djibouti	Kenya	Senegal
Argentina	Dominica	Kyrgystan	Serbia
Belize	Dominican Republic	Liberia	Sierra Leone
Benin	Ecuador	Madagascar	Slovenia
Bolivia	Egypt	Malawi	South Africa
Bosnia and Herzegovina	El Salvador	Mali	Sri Lanka
Brazil	Equatorial Guinea	Mauritania	Tanzania
Bulgaria	Ethiopia	Mexico	Togo
Burkina Faso	Gabon	Moldova	Trinidad and Tobago
Burundi	Gambia	Mozambique	Uganda
Cambodia	Georgia	Niger	Ukraine
Cameroon	Ghana	Nigeria	Uruguay
Central African Republic	Grenada	Pakistan	Venezuela
Chad	Guatemala	Panama	Vietnam
Chile	Guinea	Paraguay	Yemen
Comoros	Guinea Bissau	Peru	Zambia
Congo	Honduras	Philippines	
Costa Rica	Indonesia	Poland	
Cote d'Ivoire	Iraq	Romania	

B Data Sources and Definitions

- *Rem* refers to remittance inflows from workers into the recipient economy and this data is obtained from the World Bank. The remittances inflows are denominated in million US $ which takes into account 2005 national prices converted into international dollars using purchasing power parity (PPP) rates.

- *Pop* denotes population and is taken from Penn World Table 1.1. Data availed in Penn World Table reports population data by country from the World Bank and United Nations sources and is denominated in million of population.

- *ParisDefault* refers to default indicators as documented on the Paris Club Website. Absolute default values are denoted in million USD. The bivariate variable in this case takes the notation *ParisDummy* whereby 1 is an indicator that renegotiations through the Paris Club took place and zero if otherwise.

- *CTDefault* is data compiled by Cruces and Trebesch (2013) which takes into account default episodes due to external debt renegotiation with foreign commercial banks and foreign bondholders. This data is obtained from Christoph Trebesch's website which encompasses haircut data and debt restructuring set running from 1970-2013. Default in absolute terms is measured in original metric in million USD. The dummy indicator *CTDummy* is 1 whenever a default befitting CT description occurs and zero if otherwise.

- *lnXr* connotes the natural logarithm of the exchange rate. The exchange rate is expressed in terms of respective local national currency vs USD and the data is obtained from Penn World Tables 8.1

- ΔGDP is growth in real GDP per capita and this data is taken from Penn World Tables 8.1. Real GDP is at constant 2005 national prices in million 2005 USD.

- *lnGDPpc* refers to natural logarithm of real GDP per capita and this is obtained from Penn World Tables. This is derived by dividing real GDP by population.

- *disasters* is bivariate whereby it is 1 if there is a natural disaster that is ranked among the top ten disasters with the largest number of casualties in a given remittance recipient country and zero if otherwise. This natural disasters data is obtained from CRED Emerging Events Database. CRED defines a disaster

as a natural situation or event which overwhelms local capacity, implying a request for external assistance (Noy, 2009; EM-DAT Glossary of terms).

- *HCI* refers to human capital index which measures countries' ability to maximize and leverage their human capital endowment and is derived from Penn World Tables.

- *PoliticalS* is an index which portrays political stability and absence of violence. This estimate is obtained from World Governance Indicators and gives the country's score on the aggregate indicator in units of a standard normal distribution, i.e. ranging from -2.5 to 2.5.

- $\Delta cons$ is the growth rate of household consumption. This data is derived from World Development Indicators database.

- $\Delta OECD$ measures the growth rate of OECD countries and the data is obtained from the OECD website.

- *AF dummy* is a dummy variable which takes a value of 1 if a country is located on the African continent and zero otherwise.

- *LAC dummy* is a dummy variable which takes a value of 1 if a country is located within Latin America and Caribbean and zero otherwise.

- *EU dummy* is a dummy variable which takes a value of 1 if a country is located within Europe and zero otherwise.

- *ME dummy* is a dummy variable which takes a value of 1 if a country is located within Middle East and zero otherwise.

- *AS dummy* is a dummy variable which takes a value of 1 if a country is located within Asia and zero otherwise.

C Paris Club Default Episodes

1990	1991	1992	1993	1994	1995
Bolivia	Argentina	Argentina	Albania	Bulgaria	Bolivia
Central Afr. Rep	Benin	Bolivia	Benin	Cameroon	Camodia
Congo	Bulgaria	Brazil	Burkina Faso	Central Afr. Rep	Cameroon
El Salvador	Burkina Faso	Bulgaria	Costa Rica	Congo	Chad
Honduras	Costa Rica	Cameroon	Guatemala	Cote d' Ivoire	Croatia
Jamaica	Cote d' Ivoire	Ecuador	Jamaica	Ecuador	Gabon
Madagascar	Dominican Republic	Equitorial Guinea	Mauritania	Equitorial Guinea	Guinea
Mozambique	Egypt	Ethiopia	Mozambique	Gabon	Guinea Bissau
Niger	Gabon	Guinea	Peru	Indonesia	Mauritania
Panama	Jamaica	Honduras	Vietnam	Jordan	Senegal
Poland	Nigeria	Jordan		Kenya	Togo
Senegal	Peru	Mali		Niger	Uganda
Tanzania	Philippines	Sierra Leone		Philippines	
Togo	Poland	Tanzania		Senegal	
Trinidad & Tobago	Senegal	Togo		Sierra Leone	
Zambia		Uganda			
		Zambia			

1996	1997	1998	1999	2000	2001
Benin	Cameroon	Albania	Honduras	Albania	Bolivia
Burkina Faso	Ethiopia	Bolivia	Jordan	Benin	Cameroon
Chad	Guinea	Bosnia & Herzegovina	Mozambique	Bosnia and Herzegovina	Chad
Congo	Jordan	Central Afr. Rep	Pakistan	Burkina Faso	Ethiopia
Ghana	Madagascar	Cote d' Ivoire	Zambia	Djibouti	Georgia
Honduras	Tanzania	Indonesia		Ecuador	Ghana
Mali	Yemen	Rwanda		Gabon	Guinea
Mozambique		Senegal		Indonesia	Guinea Bissau
Niger		Uganda		Kenya	Madagascar
Peru				Madagascar	Malawi
Sierra Leone				Mali	Mali
Yemen				Mauritania	Mozambique
Zambia				Nigeria	Niger
				Sao Tome & Principe	Pakistan
				Senegal	Serbia
				Tanzania	Sierra Leone
				Uganda	Ukraine
					Yemen

2002	2003	2004	2005	2006	2007
Burkina Faso	Benin	Burundi	Burundi	Cameroon	Central Afr. Rep
Cote d' Ivoire	Ecuador	Congo	Dominican Republic	Grenada	Gambia
DR Congo	Mali	Dominican Republic	Honduras	Malawi	Sao Tome & Principe
Ethiopia		Ethiopia	Indonesia	Moldova	Sierra Leone
Ghana		Gabon	Kyrgyzstan		
Indonesia		Georgia	Nigeria		
Jordan		Ghana	Rwanda		
Kyrgyzstan		Honduras	Sao Tome & Principe		
Mali		Iraq	Sri Lanka		
Mauritania		Kenya	Zambia		
Rwanda		Madagascar			
Senegal		Niger			
Sierra Leone		Senegal			
Tanzania					
Zambia					

2008	2009	2010
Congo	Burundi	Antigua & Barbuda
Djibouti	Central Afr. Rep	Congo
Gambia	Comoros	DR Congo
Guinea	Cote d'Ivoire	Guinea Bissau
Liberia	Togo	Liberia
Togo		

Conferences with Review Process:

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Chapter 3

Remittance Inflows and State-Dependent Monetary Policy Transmission in Developing Countries

Remittance Inflows and State-Dependent Monetary Policy Transmission in Developing Countries*

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Abstract

Remittance inflows from overseas workers are an important source of foreign funding for developing and emerging economies. The literature is inconclusive about the cyclical nature of remittance inflows. To the extent remittances are procyclical they pose a challenge to monetary policy: a tightening of policy will be less effective if at the same time remittances increase strongly. The same is true for a policy easing under exceptionally weak remittance inflows. This paper estimates a series of nonlinear (smooth-transition) local projections to study the effectiveness of monetary policy under different remittance inflows regimes. The model is able to provide state-dependent impulse response functions. We show that for Kenya, Mexico, Colombia and the Philippines monetary policy indeed has a smaller domestic effect under strong inflows of remittances. These results have important implications for the design of inflation targeting in developing countries.

Keywords: Remittance inflows, monetary policy, inflation targeting, smooth-transition model, local projections

JEL classification: E52, E32, O16

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1 Introduction

Inflows of worker remittances are one of the most important sources of external funding for developing and emerging countries. Remittances have a wide array of effects on the recipient economy. They tend to contribute to financial development, affect business cycles and growth, and could lead to a Dutch Disease phenomenon, among other macroeconomic and microeconomic consequences.[1] In addition, remittance flows are less volatile than other forms of private capital inflows.

To the extent remittances impact income, prices of goods and services, asset prices and the financial system, they also interact, and potentially interfere, with monetary policy. This is particularly true if remittance flows are procyclical with regard to the home economy. The literature on the cyclical properties of inflows is inconclusive: while some papers stress the countercyclical nature of remittances, see Frankel (2011) and Buch and Kuckulenz (2010), others provide evidence for a procyclical behavior, see Lueth and Ruiz-Arranz (2007), or present mixed evidence, see Sayan (2006).[2]

It seems plausible that the cyclical properties are not constant over time. During extraordinary economic stress such as sovereign defaults, severe recessions or natural disasters remittances will serve as an automatic stabilizer and, as a result, are countercyclical.[3] However, to the extent local GDP correlates positively with GDP in the U.S. or in other advanced economies, both remittance outflows from host countries and inflows to home countries are procyclical. Remittances not only respond to business cycles, but also promote a change in the cyclical patterns in developing countries. Barajas et al. (2012) find that remittances contribute to business cycle synchronization between host and home countries, in particular of economic downturns.

Procyclical inflows are particularly relevant for monetary policy: suppose a central bank in a developing country pursues an inflation target and adjusts the short-term interest rate in a way to achieve the target inflation rate. If the economy overheats, that is, if growth is high and inflation is above target, the central bank will raise its policy rate. If this economy at the same time experiences inflows of remittances, that is if remittance inflows are procyclical, the contractionary effect of tighter monetary policy could be dampened and even overturned. Likewise, if the economy is depressed and the central bank lowers the interest rate in order to stimulate activity, a sudden drop in remittance inflows can neutralize this expansionary policy move. Taken together, large swings in remittances can impact the effectiveness of monetary

[1] See Chami et al. (2008) for a useful survey of the evidence.

[2] This literature is further discussed in the next section.

[3] Machasio (2016) studies the stabilizing role of remittance inflows after sovereign defaults.

policy and the strength of monetary policy transmission, respectively. Based on the policy-experience in the Philippines, Bayangos (2012, p. 386) notes

> "...the increase in remittances will make monetary policy less effective. ... the increase in remittance inflows leads to an increase in liquidity in the financial markets and to a downward pressure on the interest rate, leading to the possibility that a monetary policy action will have to be strong to counter these impacts."

This loss in effectiveness of monetary policy under procyclical remittance inflows, which has not yet been formally investigated, is studied in this paper. To analyze this research question, we estimate a series of nonlinear empirical models in order to obtain impulse response functions. These functions show the response of important macroeconomic variables to a change in the short-term interest rate. Importantly, we differentiate between a state with strong remittance inflows and one with weak inflows. We show that the impulse response functions differ significantly across both states.

The impulse response functions are derived from local-projections following Jordà (2005). One of the major advantages of local-projections over competing models, among them vector autoregressions, is that they can easily accomodate state-dependent coefficients and, hence, state-dependent impulse-response functions, even for relatively small sample sizes. We estimate two versions of the state-dependent model: in the first the states are separated by appropriately defined dummy variables which reflect whether remittances growth is above the median growth rate or not. In the extension, our second model, we allow for a smooth transition between states driven by the growth rate of remittances.[4] This is a generalization of the first model since we do not impose an abrupt switch from one state to the other.

The models are estimated for four countries (Kenya, Mexico, Colombia and the Philippines), all of which receive large and volatile inflows of remittances as important sources of foreign financing. Although there are countries for which remittances play an even more important role, i.e. Armenia or El Salvador, these countries typically lack the macroeconomic data we need for this study.

We show that indeed the effect of monetary policy on inflation and output is different under strong remittance inflows. In particular, a monetary policy tightening has significantly smaller effects on inflation and output in a state with high remittance inflows. Likewise, a restrictive monetary policy shock leads to a larger appreciation

[4]Smooth transition local projection models have recently been applied by Tenreyro and Thwaites (2016) and others to study whether the effects of monetary policy shocks depend on the state of the business cycle.

of the currency if, at the same time, remittances pour into the economy. The same shock leads to a smaller increase in long-term bond yields under strong inflows of workers' remittances. Hence, we find that the transmission of monetary policy is muted under exceptionally strong inflows.

A set of counterfactuals is constructed in order to exclude alternative explanations of our findings. We show that the results are not due to the U.S. business cycle, which drives remittances and affects the cycle in small open economies. Likewise, we exclude an explanation based on the domestic business cycle. The results are different from a model in which the effects of monetary policy are allowed to differ between periods with growth rates being above or below the median.

The two papers closest to this study are Mandelman (2013) and Barajas et al. (2016). The first author presents a general equilibrium model with a large variety of frictions, among them credit constrained households. Based on Philippine data he shows that remittance flows smooth the consumption path of credit constrained households. He shows that a flexible exchange rate regime is preferable. While he outlines the normative consequences of remittances for the design of policy regimes, he does not directly address our empirical question. The second paper, Barajas et al (2016), uses a reduced-form model to show that remittances lead to a decoupling of monetary policy rates and credit conditions and this affects the transmission of monetary policy.

The remainder of this paper is organized as follows. Section two links our research to major strands of the literature. Section three introduces linear and nonlinear local projections. The data used in this study is explained in section four. The results and a couple of robustness checks are discussed in section five. Section six generalizes the model to a smooth-transition model and section seven draws policy conclusions from our results.

2 Related literature

There are various strands of the literature which explore the relationship between remittances and domestic macroeconomic variables. Our paper is particularly related to three of these branches.

The first, as mentioned in the introduction, a number of papers evaluate the effect of remittances on business cycles. The evidence as regards the cyclical properties of remittance inflows is mixed. Econometric results obtained by Frankel (2011) show that remittances are countercyclical with respect to the income in workers' country of origin and procyclical with respect to income earned in the host country. According

to these results, remittances constitute a particularly valuable component of balance of payments in domestic downturns or when international investors flee the country. Similarly, Buch and Kuckulenz (2010) support the notion of the countercyclical nature of remittance inflows.

This conclusion, however, is not generally shared in the literature. On the flip side, Lueth and Ruiz-Arranz (2007) report the correlation between detrended global remittances and detrended GDP and find that remittances are procyclical, albeit to a lesser extent than exports, official aid and portfolio investment. Supporting mixed evidence, Sayan (2006) studies 12 developing and emerging countries and does not find general countercyclicality of remittance flows. Ruiz and Vargas-Silva (2010) show that the cyclical properties of remittance inflows change over time. Based on data from Mexico they conclude that there is no general cyclical pattern of remittance inflows. Model-based evidence provided by Durdu and Sayan (2010) is also inconclusive as the relative size of opposite effects on the cyclical nature is unclear.

A second, very small strand of the literature studies the relationship between remittances and monetary policy. According to model proposed by Vacaflores (2012), higher levels of remittances alter the effectiveness of monetary policy. The typical monetary injection leads to a decline in the nominal interest rate that raises investment but because it generates a wealth effect that initially reduces work effort, it creates an initial drop in output before experiencing the typical hump-shaped improvement. Higher levels of remittances accentuate the liquidity effect arising from the monetary shock, increasing investment and capital, but also enable the household to increase its leisure time. This negative effect on labor is large enough to depress output over time. Using data for the Philippines, Mandelman (2013) develops and estimates a heterogeneous agent model to analyze the role of monetary policy in a small open economy subject to sizable remittance fluctuations. His findings reveal that in a purely deterministic framework, a fixed exchange rate regime avoids a rapid real appreciation and performs better for recipient households facing an increasing trend for remittances. A flexible floating regime is therefore preferred in the Philippine case when unanticipated shocks driving the business cycle are considered. Bayangos (2012) is the only paper that touches explicitly on the effectiveness of monetary policy. The author provides simulation results for the Philippines suggesting that the monetary policy pass-through tends to moderate once the impact of large remittance flows is taken into account.

The third strand addresses monetary policy in developing economies in general. In evaluating monetary policy in remittance dependent economies, remittance inflows

have been identified as interest-insensitive private transfers across international borders and that they expand balance sheets in the recipient countries directly.
However, given the challenging institutional, informational and high risk environment prevailing in these countries, banks prefer to invest the additional funds in safe and liquid assets, including lending to government. As a result, liquidity in banks becomes ample and their marginal cost of loanable funds becomes delinked from movements in the policy rate, thereby weakening a major channel through which changes in the policy rate are transmitted to the lending rate and lending behavior by banks (Barajas et al, 2016). According to Mbutor (2010) while evaluating the role of monetary policy in enhancing remittances for economic growth in Nigeria, he posits that developing countries mostly require full package for growth enhancement because fiscal and monetary policies are inextricable except in terms of instruments and implementing authorities. Nevertheless, monetary policy appears more potent in correcting short term macroeconomic maladjustments because of the frequency in applying and altering the policy tools, relative ease of its decision process and the sheer nature of the financial system.

3 Local projections

In this paper we derive impulse response functions from local projections as suggested by Jordà (2005). Rather than estimating a full dynamic model for several endogenous variables such as a vector autoregressive (VAR) model, our method rests on a single equation model. The interpretation of an impulse response function in terms of the response of a forecast of a variable h periods ahead to a shock in t is identical in both modelling approaches. We will introduce the linear local projection first followed by the nonlinear model, which is our main tool in this paper.

3.1 Linear model

We start with a series of regressions of a dependent variable dated $t+h$ on a driving variable dated t as well as a set of control variables. Our estimated model is the following

$$y_{t+h} = \alpha_h + \beta_h R_t + \gamma_h' \sum_{s=1}^{q} \mathbf{x}_{t-s} + \delta_h' \sum_{s=1}^{q} \mathbf{z}_{t-s} + \varepsilon_{t+h}, \tag{1}$$

where y_t is the dependent variable, $\mathbf{x}_t$ is a vector of domestic variables that potentially drive y_t and $\mathbf{z}_t$ is a vector of foreign variables. We include up to q lags of domestic and foreign control variables. The measure of monetary policy, which in

our case is the short term interest rate, is denoted by R_t. Hence, the coefficient β_h measures the impact of a change in policy at t on the dependent variable h periods ahead. Plotting β_h as a function of h results in an impulse response function.

The model is estimated for Kenya, Mexico, Colombia and the Philippines. These countries have been chosen because they are known to be strongly affected by remittance inflows from abroad. We use four alternative dependent variables: the log of real GDP, the log of the CPI, the log of the exchange rate against the U.S. dollar and the yield on long-term government bonds. These variables are assumed to characterize the transmission process of monetary policy.

The domestic control variables are real GDP, CPI, and the exchange rate. All models other than the model for bond yields include the log of U.S. real GDP, the log of global food prices and the log of remittance inflows as a foreign control variable. All three foreign control variables reflect the high dependency of developing and emerging countries on the global business cycle as well as the importance of global food prices for domestic inflation. We include only one lag of the control variables, that is, we set $q = 1$.[5] Due to the fact that the dependent variable is h periods ahead, the error terms will exhibit serial correlation. We therefore apply a Newey-West correction to our estimation errors, which we use to construct a confidence band around the estimated series of β_h coefficients. As suggested by Jordà (2005), the maximum lag for the Newey-West correction is set to $h + 1$.

Our measure of R_t is the short-term interest rate. The short-term interest rate should summarize the overall policy stance. In all four countries the zero lower bound on nominal interest rate is not a binding constraint. As a matter of fact, a change in the short-term rate is not necessarily a policy shock as this change could have been anticipated based on the knowledge of the state of the economy and the central bank's reaction function. However, we do not believe this is a large problem for our analysis as (1) the policy frameworks of all four central banks included in our study are less transparent than in advanced economies such that anticipating policy moves is more difficult and (2) the macroeconomic control variables at least to some extent capture the endogenous response of monetary policy to the state of the economy.

There are several advantages of local projections as compared to VAR models: (1) The model requires estimating only a handful of parameters. Thus, it is particularly suited for a situation in which the length of available time series is short such as in developing countries. (2) Since we do not need to estimate a complete system, the model is more robust with regard to model uncertainty. This should result in more

[5]The model for real GDP and the CPI also includes a time trend.

robust estimates.

3.2 Nonlinear model

Another key advantage of local projections over competing VAR models is that they allow us to study non-linearities in the monetary transmission process easily.[6]
Suppose there are two observable regimes, I and II, that govern the impact of monetary policy. We construct a dummy variable, I_t, which is one if the economy is in regime I and zero if the economy is in regime II. For $I_t = 1 \; \forall \; t$ the model collapses to the linear benchmark.
The model can easily be generalized to encompass regime-dependent dynamics

$$\begin{aligned} y_{t+h} \;\; = \;\; & I_{t-1} \left[\alpha_h^I + \beta_h^I R_t + \left(\gamma_h^I\right)' \sum_{s=1}^{q} \mathbf{x}_{t-s} \right] \\ & + (1 - I_{t-1}) \left[\alpha_h^{II} + \beta_h^{II} R_t + \left(\gamma_h^{II}\right)' \sum_{s=1}^{q} \mathbf{x}_{t-s} \right] + (\delta_h)' \sum_{s=1}^{q} \mathbf{z}_{t-s} + \varepsilon_{t+h}. \end{aligned} \tag{2}$$

In this regression model, the constant, the coefficient on the monetary policy variable and the coefficient on the domestic control variables are allowed to be regime-specific. The foreign control variables are assumed to have a regime-invariant effect in order to maintain a relatively parsimonious model.[7]
In our case let regime I be a state of the world with remittance growth above the median. In contrast, regime II exhibits below-mean inflows of remittances. Hence, both regimes are observable, which differentiates the model from models of unobservable regimes such as Markov-switching models. We assess whether the impact of monetary policy is different in regimes with high growth rates of remittances. Hence, the two regimes are the following

$$I_t = \begin{cases} 1 & \text{if } v_t > \tau \\ 0 & \text{if } v_t \leq \tau, \end{cases}$$

where τ is the country-specific median of the year-on-year growth rate of remittance inflows, v_t. Hence, β_h^I reflects the impact of monetary policy on the endogenous variables in a regime with high remittance inflows and β_h^{II} stands for the effect of

[6]Nonlinear local projections have among others, been applied by Ramey and Zubairy (2014) in their study of fiscal multipliers in booms and recessions, by Nodari (2015) in order to estimate the effect of credit supply shocks in different stages of the business cycle and by Caselli and Roitman (2016) who study the nonlinear interest rate pass-through.

[7]As in Ramey and Zubairy (2014) and others we use the lagged indicator function, I_{t-1}, in this model. Using I_t instead would not change our results.

monetary policy if remittance inflows are subdued.[8] While we use the median of the growth rate of remittances as a critical value to separate regimes, the critical value could also be set differently. The higher the critical value, the more extreme are the remittance inflows scenarios captured and the larger is the difference in the estimated β_h coefficients across regimes.

As mentioned by Ramey and Zubairy (2014), the procedure for calculating impulse responses involves no iterations. For each horizon h a new regression is estimated. In contrast to other kinds of regime-dependent impulse response functions, such as the ones obtained from Markov Switching models, we do not need to assume that a given regime prevails for the entire duration of the response.

4 Data

We investigate nonlinear monetary policy transmission in the presence of remittances in four developing countries which are known to be strongly affected by remittance inflows. We estimate the model for Kenya, Mexico, Colombia and the Philippines during the period 2000Q1-2015Q4. The choice of the sample period is dictated by data availability.

Table (1) provides some descriptive statistics on remittance inflows into the sample countries. The countries strongly vary according to the magnitude of inflows relative to their economic size. The list of the most important source countries of inflows reveals the overwhelming influence of the U.S., which is why we pay special attention to the U.S. business cycle as a potential alternative explanation for our findings.

While Mexico, Colombia and the Philippines have adopted a formal inflation targeting regime, the Central Bank of Kenya pursues price stability without a formal inflation target. All four economies have a floating exchange rate. Thus, we are confident the small empirical model captures the monetary transmission process realistically. The main variables of interest characterizing the monetary transmission process are CPI, real GDP, the yield on long term government bonds, the short-term interest rate and the exchange rate against the U.S dollar.

We seasonally adjust CPI and real GDP and express them in natural logarithms. We use the Census X12 method to seasonally adjust our series. The exchange rate, which we also use in natural logs, is defined as local currency per U.S dollar. The data sources and details for each country are given in the appendix.

The model includes also two variables capturing global economic conditions which

[8] We restrict ourselves to two regimes since we only have a relatively short sample with quarterly data.

are of particular relevance for developing and emerging economies. These variables are, first, the log-level of U.S. real GDP and, second, the log-level of the global food price index.[9]

A crucial variable is the inflows of remittances. For all four economies we use remittance inflows in U.S. dollars from the rest of the world. Again, details about each series can be found in the appendix. Remittances are used to separate two distinct regimes. We calculate the year-on-year growth rate in remittances to study swings in inflows since the quarter-on-quarter growth rates would be far too volatile. The dummy variable for the identification of states is set to one if the growth rate is higher than a critical value τ, which is the median of remittances growth.[10] We restrict the analysis to two regimes exhibiting high and low growth of remittance inflows. This is due to the short sample period available. We also use the log of remittances as a control variable in each regression.

Figure (1) shows the year-on-year growth rate of remittance inflows for all four economies. In addition, the horizontal line reflects the median growth rate of remittance inflows. The shaded areas are periods in which remittances growth lies above the median growth rate. In can be seen that all four economies experienced large swings in remittance inflows. Moreover, these swings do not appear to be synchronized across countries.

5 Results and robustness

The results are presented in three steps. First, we discuss the evidence from linear local projections. Second, we shed light on the nonlinear nature of the transmission process due to large swings in remittance inflows. In a third step, we present counterfactual results to corroborate the robustness of our findings.

5.1 Results from linear model

Figures (2) to (5) present the results from the estimated linear model. For each endogenous variable we show the coefficient on monetary policy as a function of the horizon h. The point estimates are surrounded by 90% confidence bands.

Figure (2) displays the linear model for Kenya. A one percentage point increase to the Kenyan short-term interest rate leads to a hump-shaped fall in domestic prices. While prices start to decline immediately, output starts to fall after six quarters.

[9] Both variables are obtained from the FRED database.

[10] Using the mean instead would result in virtually identical results. Results for a higher critical value, e.g. the mean plus half the standard deviation of remittances, are available upon request.

Following the monetary tightening, the Kenyan currency appreciates against the U.S. dollar. If the short-term interest rate rises by one percentage point, the yield on long term bonds also increases by a quarter of a percentage point, thus the yield curve becomes flatter. These results are in line with our expectations and support the view that the transmission process in Kenya is similar to other small open economies.

Mexico's results are presented in Figure (3). In contrast to Kenya's case, prices are less sensitive to monetary policy and fall only moderately after three quarters. The response of real GDP is consistent with this as output exhibits no significant drop after a monetary tightening. As for the exchange rate, the interest rate increase leads to an appreciation of the Mexican peso against the U.S. dollar. The response of the long-term interest rate is positive, as in the case of Kenya, and highly significant. Again, the slope of the term structure flattens after the policy tightening.

Figure (4) shows the response of the endogenous variables to the short-term interest rate in Colombia. Prices and output respond immediately and decrease in their respective values after the interest rate increase. As expected, a policy tightening is contractionary as regards output and prices. While the exchange rate response is insignificant, the response of long-term interest rates is again consistent with the textbook model of monetary policy transmission.

Finally, the results for the Philippines are shown in Figure (5). Initially, Philippine prices seem to be insensitive to policy though prices start to fall eight quarters after the interest rate shock. As in Mexico and Kenya, output responds immediately and falls persistently reaching the maximum response after six or seven quarters. The interest rate increase raises the value of the Philippine Peso against the U.S. dollar, though this response becomes significant a year after the initial shock. As in all other countries, yields on long-term bonds increase when the central bank tightens. In all four countries, the transmission of policy impulses follows the textbook model of monetary policy in small open economies under (de facto) inflation targeting. Thus, the four countries highlighted here are well suited to study how strong swings in remittance inflows affect the transmission of policy.

5.2 Results from nonlinear model

The impulse responses from the nonlinear model are shown in Figures (6), (7), (8) and (9). In each figure, we report the impulse responses and the corresponding 90% confidence intervals for the two states. The responses to monetary policy if remittance inflows are high, hence the economy is in state I, are shown by the dotted green line. The responses for state II, a situation with remittance inflows

being below the median, are shown by the dotted black line.
For all four countries, the fluctuations in state I are less pronounced than in state II. This implies that the endogenous variables react more strongly to monetary policy during low growth of remittances than during periods when a country receives high remittances suggesting that transmission of monetary policy is muted under exceptionally strong remittance inflows.
The difference between high remittances and low remittances is seen most clearly when prices and output are taken into account. Prices and output react more strongly when countries experience low remittance flows than when they receive high remittance inflows.
According to Figure (6), following a policy tightening prices in Kenya fall by approximately 0.1% in state I. When the economy is in state II, however, the same policy impulse leads prices to fall by 0.5%. The same pattern can be observed for output. Under strong remittance inflows, monetary policy depresses output by about 0.1%, while under low inflows policy triggers a contraction of 0.5%.
In the linear model presented before, the exchange rate appreciated against the U.S. dollar after the policy tightening. We expect the appreciation to le larger when, at the time of the policy shock, large amounts of remittances flow into the country. This is indeed what we observe for the case of Kenya.
Strong remittance inflows tend to increase liquidity and thus reduce long-term interest rates. Thus we expect a policy tightening to have a smaller effect on long-term interest rates in state I compared to state II with weak remittance inflows. For Kenya, see Figure (6), bond yields indeed increase strongly in state II and barely respond to monetary policy in state I.
For Mexico, see Figure (7), we see a similar pattern. In state I, monetary policy is less contractionary than under state II. Furthermore, under weak inflows of remittances, monetary policy has only a very small effect on the exchange rate. The response fluctuates around zero such that the cumulative response is insignificant. In state I, however, when the demand of overseas workers for the domestic currency multiplies the the effects of the policy tightening, we see a significant appreciation of the Mexican peso. Bond yields fall if remittances pour in and more than offset the effect of the policy tightening, while they clearly increase in state II.
For Colombia, see Figure (8), the state-dependent impulse responses are significantly different, although the difference between the two states is smaller than for Kenya and Mexico. Again, the policy tightening is less effective in state I. While there seems to be no state-dependence of the exchange rate response, bond yields exhibit a negative response in state I and the standard response, which we could observe in

the linear model, in state II.

Figure (9) for the Philippines shows that in regime I, prices increase rather than decrease following the shock. Output, however, does not respond differently across both states, although there is a small tendency for policy being less contractionary in state I. The exchange rate response is not in line with our expectations: we find the exchange rate to depreciate in state I and to slightly appreciate in state II. However, the response of bond yields is again consistent with the overall pattern shown in this paper.

Taken together we see evidence for a reduction in the effectiveness of monetary policy under strong inflows of remittances. A monetary policy shock is less contractionary if at the same time the economy receives large inflows of remittances.

Figure (10) gives a summary of the baseline results. For output and inflation in each country we calculate the cumulative impulse response in each of the two states. We then calculate the differences between the cumulative response in state I and state II. The higher the resulting number, the larger is the difference in policy effectiveness with policy having a larger effect in state II. The resulting four observations for output and inflation, respectively, are shown in a scatter plot against the standard deviation of remittances flows.

A few observations stand out: first, in all four countries the difference is positive. Second, with the exception of Mexico, the difference is larger for inflation than for output. Third, again with the exception of Mexico, the differences for both variables increase with the standard deviation of remittances. While we should be careful not to over-interpret the findings based on four countries only, this plausible finding highlights the role played by the volatility of remittances inflows. We will elaborate this further in the concluding section.

5.3 Robustness

In this section we provide additional results which underline the hypothesis of less powerful monetary policy in periods of strong remittances inflows. The robustness checks are meant to rule out alternative explanations which would result in observationally equivalent findings.

The first explanation could be that the results presented in the previous section reflect the domestic business cycle. In fact, if remittances are countercyclical, they should strongly flow into the economy during recessions and less strongly in boom periods. For the U.S. economy, Tenreyro and Thwaites (2016) show that monetary policy is more effective in booms rather than recessions. If, by measuring remittances inflows, we indirectly capture the domestic cycle, our findings would be similar.

To rule out this competing explanation, we construct a counterfactual. We re-estimate the model with the regime-dummies now reflecting the domestic cycle. In particular, I_t equals one if the domestic GDP growth rate is below the median and zero otherwise. To save space, we do not report the entire set of impulse responses again. Instead, we summarize the information content by showing the cumulative impulse responses over $h = 0, ..., 12$ as a single number in Table (2).[11] We report the results for prices and GDP only since these are the core variables for gauging the effectiveness of monetary policy. The table also contains the cumulative responses of the linear model and the benchmark nonlinear model, respectively.

We would rule out an alternative explanation for our findings if (1) the resulting cumulative responses are not different across regimes or (2) the relative magnitudes of the responses are inconsistent. The former would be the case if one of the two cumulative responses lies in the confidence band around the other response. The latter would be the case if, for example, prices respond more strongly in state I while output is more sensitive to monetary policy in state II.

For Kenya, we find that the response of prices, which is -2.29% in state II, lies in the 90% confidence interval around the cumulative estimate in state I. Hence, the price responses are not not statistically distinguishable. Likewise, the output response in state II, which is -1.38%, lies in the confidence band around the estimate for state I. Hence, the estimation based on the domestic cycle does not result in a significantly different transmission mechanism and, as a result, speaks against the domestic cycle being an explanation for our findings.

For Mexico, each price response lies in the confidence band of the other response. The same is true for the output responses. Hence, we can also exclude the alternative explanation. In the case of Colombia, both the price and the output responses of state I are not distinguishable from the responses in state II. Hence, the alternative explanation can be discarded. The same is true for the Philippines. These findings strengthen the case for remittances inflows being the source of policy ineffectiveness.

The second alternative explanation is that with two states of remittances inflows we simply capture the U.S business cycle or the cycle in advanced economies, respectively. A reduction in policy effectiveness in Kenya could simply be the result of Kenya being positively affected by high export demand from the U.S. In this case monetary policy has less grip on domestic demand, which instead is driven by booming economies abroad. If a boom in the U.S. allows workers to transfer higher

[11] As a matter of fact, the cumulative responses are just one way to summarize the impulse response functions. A typical caveat is that the cumulative response contains no information about the shape of the response, e.g. the hump-shaped response of most macroeconomic aggregates. Hence, the cumulative number discussed here should be interpreted with some caution.

remittances, the resulting impulse responses would be observationally equivalent to our benchmark model.

To rule out this explanation, we run the model presented before with an important modification: now the indicator variable I_t is one if the growth rate of the U.S. economy is above its median and is zero otherwise. The results are shown in the fourth row for each country in Table (2). For Kenya, the responses of prices and output are again indistinguishable as each response lies in the confidence band of the other. The same can be observed for Colombia and the Philippines.

For Mexico, however, we find that the U.S. cycle leads to significantly different price and output responses in the two regimes. However, here our second criterion spelled out before applies: the response are inconsistent across variables, thus speaking against the U.S. cycle being an explanation for our findings. In particular, prices appear to be more sensitive to monetary policy in state I while output increases in state I and falls in state II after a policy tightening. Hence, as regards output policy is more effective in state II. Based on this inconsistency, we also rule out the U.S. business cycle as a competing explanation for our results.

It could also be argued that the economy is not jumping between different states but rather adjusting gradually to changes in remittances inflows. Since we need to modify the models to account for a smooth transition between states, we devote a separate section to this robustness check.

6 Evidence from smooth-transition local projections

The model estimated before allows for two distinct states with an abrupt transition between them. If the economy experiences a growth rate which crosses the median, the economy immediately jumps from state II to state I. This is a strong assumption which we now want to relax. We draw on the work of Tenreyro and Thwaites (2016) and Born et al. (2016), among others, and combine state-dependent local projections with a smooth transition between states. While these models haven been used to study fiscal multipliers and monetary policy shocks in advanced economies during expansionary and contractionary periods, they have not been applied to small open economies.

The estimated smooth-transition local projection (STLP) model is

$$
\begin{aligned}
y_{t+h} \;=\; & F\left(v_{t-1}\right)\left[\alpha_h^I + \beta_h^I R_t + \left(\gamma_h^I\right)' \sum_{s=1}^{q} \mathbf{x}_{t-s}\right] \\
& + \left(1 - F\left(v_{t-1}\right)\right)\left[\alpha_h^{II} + \beta_h^{II} R_t + \left(\gamma_h^{II}\right)' \sum_{s=1}^{q} \mathbf{x}_{t-s}\right] + \delta_h' \sum_{s=1}^{q} \mathbf{z}_{t-s} + \varepsilon_{t+h},
\end{aligned} \tag{3}
$$

where the transition function $F(v_t)$ has replaced the I_t dummy variable. Otherwise the interpretation of the coefficients remains unchanged.

The term $F(v_t)$ determines in which of the two states the economy is as a function of v_t. The important difference with regard to the model in the previous section is the fact that $F(v_t)$ is a smooth, increasing function of v_t. In accordance to the literature, this function is parameterized as a logistic function with

$$
F\left(v_t\right) = 1 - \frac{1}{1 + \exp(\alpha v_t)}, \tag{4}
$$

where v_t is now the standardized and centered year-on-year growth rate of remittances and $\alpha > 0$. This function is bounded between zero and one. The parameter α determines how sharp the transition between regimes is. In this application, as in Tenreyro and Thwaites (2016), we impose rather than estimate α. Specifically, we set $\alpha = 3$.[12] Figure (11) plots $F(v_t)$ as a function of two alternative values for α. It can be seen that $\alpha = 3$ allows for a relatively smooth transition. For $\alpha \to \infty$, the model immediately shifts from one state to the other if demeaned and standardized remittance inflows cross zero. As a result, the model approaches the state-dependent model from the previous sections.

For each country, the resulting probabilities of state I, the state with high remittances growth, are plotted in Figure (12). An important difference with regard to the state-dependent model estimated before is that the model allows economies to be in the transition process towards state I or II, respectively. In this sense the STLP model is a generalization of the state-dependent model. In fact, given the relatively smooth evolution of macroeconomic variables, it is plausible to assume that the economy gradually moves from one state to the other.

The impulse response functions are shown in Figures (13) to (16). For Kenya, see Figure (13), the results of the smooth-transition model are very similar to those from the model discussed in the previous section. Again, we find strong evidence in favor of a state-dependent monetary transmission mechanism. In Mexico, the smooth-transition results exhibit a smaller difference in the response of prices across

[12] Using alternative values for α does not change the results.

regime than in the previous model. For the output response, see Figure (14), the difference between the two states is larger. Under strong remittance inflows a one percentage point increase in the interest will be expansionary, while under weak remittance inflows the same shock causes a drop in GDP by 1% to 2%. Likewise, the state-dependence of the response of the exchange rate is more pronounced in the smooth-transition model. The results for Colombia and the Philippines, respectively, see Figures (15) and (16), also support the previous set of results.

As a result of the previous discussion we can conclude that the state-dependence of monetary policy effectiveness is relatively robust with respect to the way the transition between states is modeled. All findings suggest that monetary policy has a larger impact on inflation, output and long-term interest rates when remittance inflows are low. In the high-remittances regime, the effectiveness is reduced significantly.

7 Conclusions

Many developing and emerging countries strongly depend on remittance inflows from overseas workers. In this paper we showed that these inflows reduce the effectiveness of monetary policy. An interest rate increase is less contractionary in periods of strong remittance inflows. Likewise, a policy easing implies less stimulus during times with low remittance inflows. The results have been derived from a series of state-dependent local projection models for Kenya, Mexico, Colombia and the Philippines.

The interference of remittance inflows with monetary policy is a facet of the dilemma of open-economy macroeconomic policy. As Rey (2013) argues, to the extent there is a global cycle in financial flows which is decoupled from domestic conditions and capital is free to flow in and out of countries, monetary policy at the national level is constrained. Importantly, this is independent from the exchange rate regime, thus turning the traditional trilemma of macro policy into a dilemma between openness for capital inflows and independent monetary policy. Our results corroborate Rey's (2013) view for the special case of remittance inflows.

As a matter of fact, one way to escape the dilemma is to restrict the flow of capital. However, from the perspective of developing countries this is unwise given the beneficial long-term impact of capital inflows including the inflow of remittances. In particular, remittances have been shown to improve financial development (Aggarwal et al., 2011) and reduce poverty (Gupta et al., 2009), among other long-term effects.

Countries could also design policies to channel remittance inflows into long-term growth enhancing investments such as human capital formation, institution-building and infrastructure investments. The less remittance inflows drive up aggregate demand, the more monetary policy is able to target inflation.

A second option is the design of monetary and financial stability policies, respectively. The results have shown that ability of the central bank to target inflation can be severely hampered if the economy experiences swings in remittances. For an inflation targeting central bank this means that policy should take remittance flows into account when setting policy and, to the extent possible, scale their policy step accordingly. To elicit the same effect on macroeconomic aggregates, a more bold interest rate step is needed if remittance inflows are high.

We have seen that, with the exception of Mexico, the state-dependence of policy effectiveness increases with remittances volatility. This suggests that policies conducive to stabilizing the inflow of remittances might also reduce the state-dependence of monetary policy effectiveness.

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A Data Sources and Definitions

This appendix contains details about the data series used in this paper.

Kenya

The series for CPI and real GDP are obtained from the Kenya National Bureau of Statistics website. The GDP series exhibits a structural break in the level in 2009 due to the rebasing of Kenyan national accounts. We use the pre-2009 growth rates to extrapolate the post-2009 series backwards in order to overcome this problem. Remittances data is obtained from Central Bank of Kenya (CBK) website. We interpolate annual remittances series to obtain a quarterly series between 2000-2003. Both the short-term interest rate and the exchange rates for Kenya are also obtained from CBK website. The yield on long term government bond for each of the four countries is obtained from investing.com, a global financial portal, and is expressed in percentage points.

Mexico

Mexican CPI data is obtained from Instituto Nacional de Estadistica y Geografia. We derive the real GDP series from Thomson Datastream while we rely on remittance data from the Banco de Mexico website. We obtain both the short-term interest rate and the exchange rate for Mexico from the FRED database.

Colombia

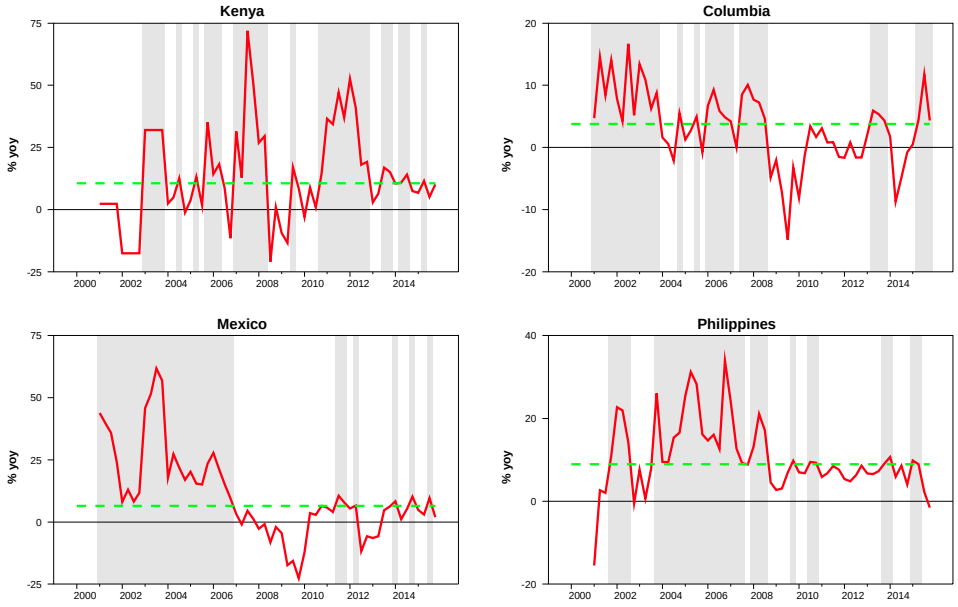
We obtain Colombian quarterly CPI series from Thomson Datastream. The National Administrative Department of Statistics is the official statistical website for Colombia and we extract real GDP series from this website. We obtain remittance flows, the short term interest rate and the exchange rate from the Banco de la Republica de Colombia website.

Philippines

The Philippine Statistics Authority is our source of Philippine CPI data. We obtain real GDP series from Thomson Datastream. We obtain both remittances and the short term interest rate data from the Bangko Sentral ng Pilipinas website. We also obtain the exchange rate of the Philippine peso per U.S dollar from the Central Bank of the Philippines website.

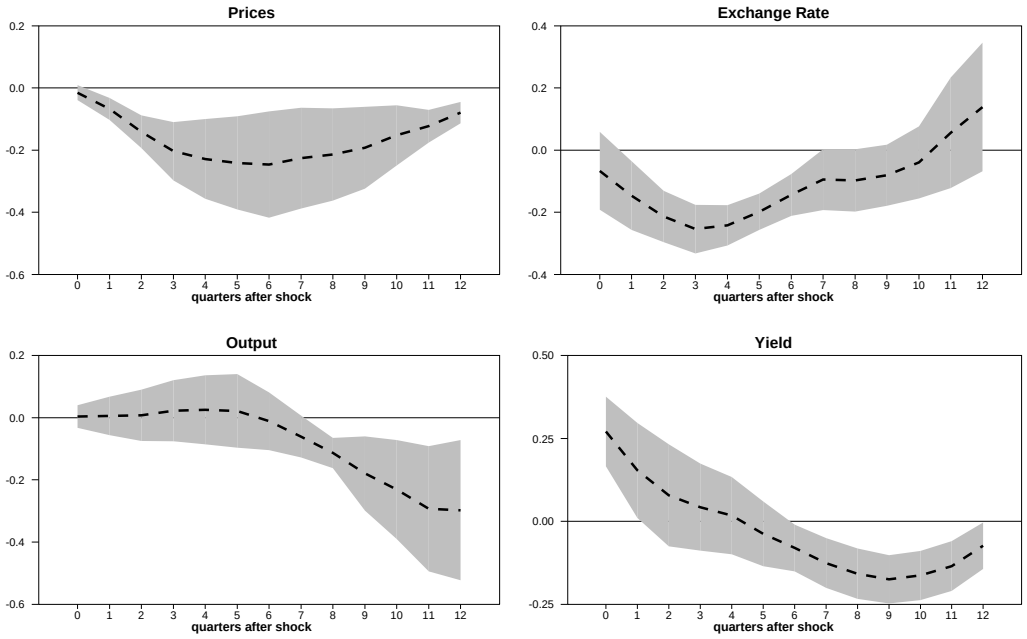
B Figures and Tables

Figure 1: Remittance inflows



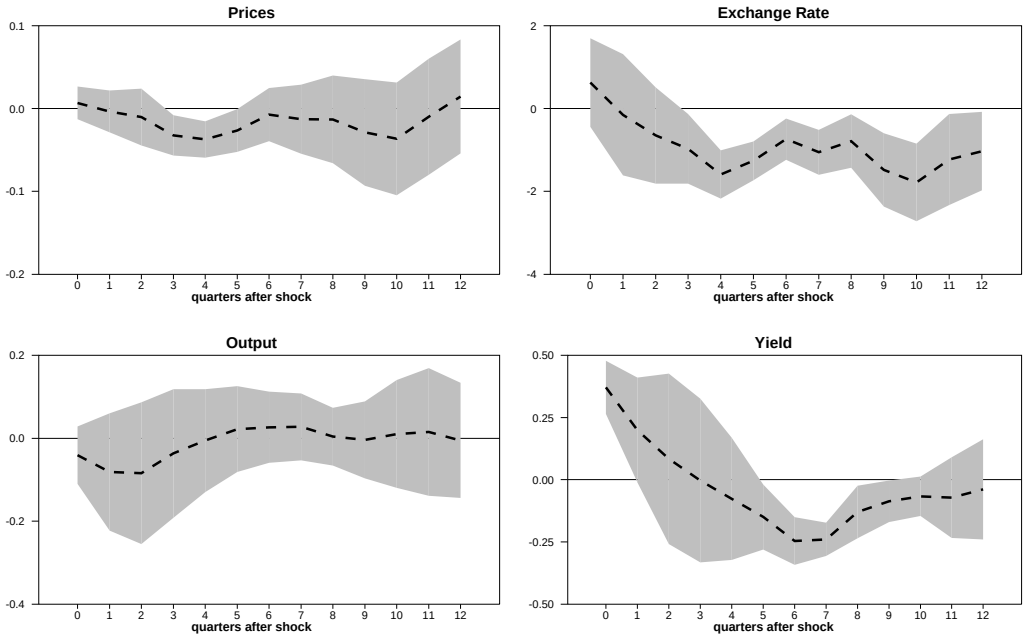
Notes: Quarterly year-on-year percentage changes in remittance inflows (in %) in red (solid line). The green dotted line is the median growth rate. Shaded regions are episodes with above-median growth rates.

Figure 2: Kenya - Response to interest rate change



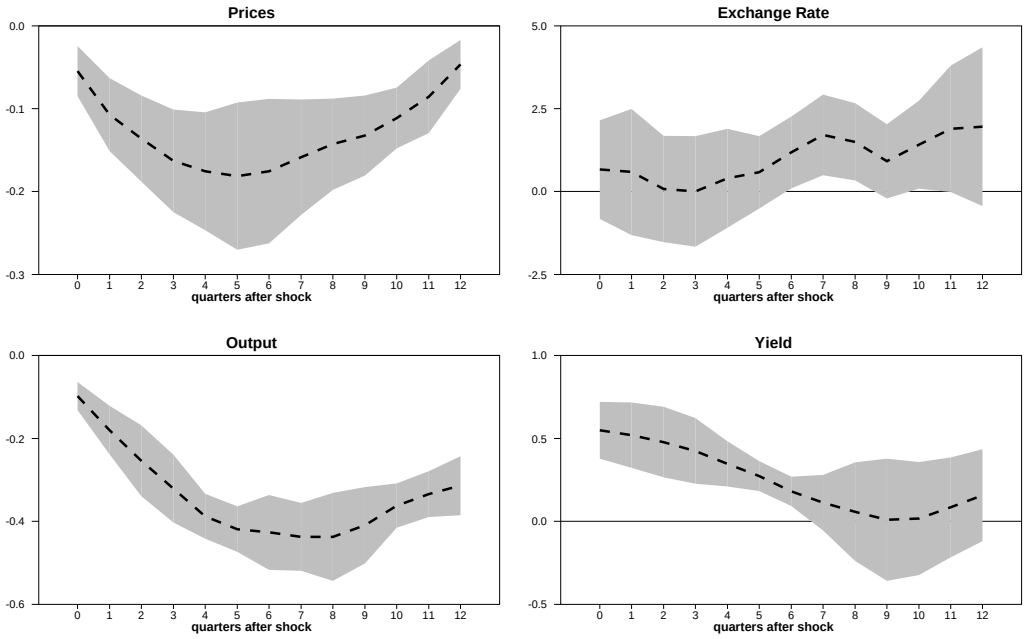
Notes: The dotted line is the impulse response based on local projections. The shaded area reflects a 90% confidence band around the point estimate.

Figure 3: Mexico - Response to interest rate change



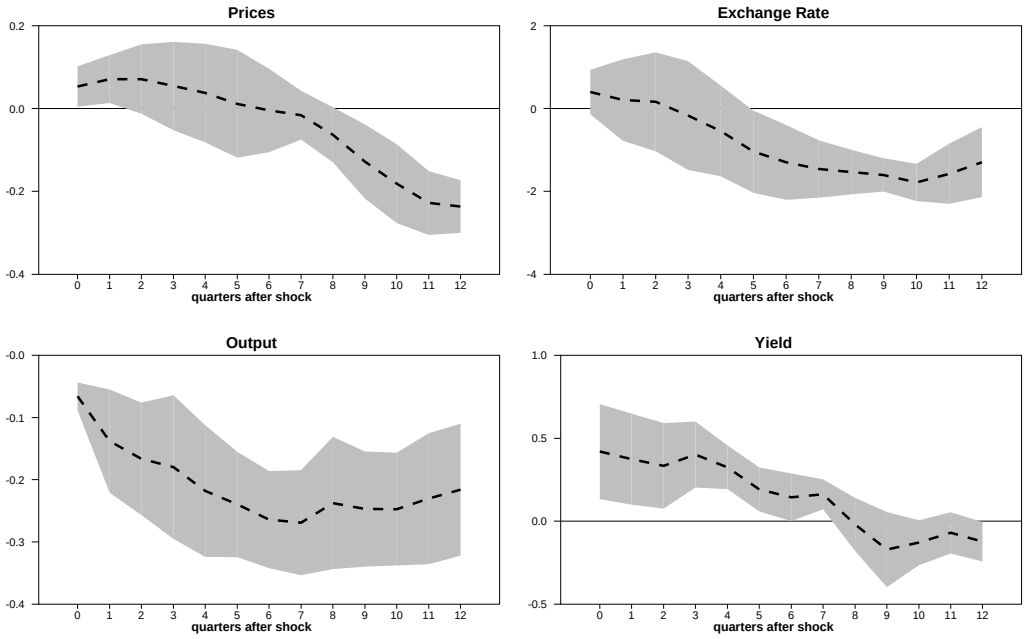
Notes: The dotted line is the impulse response based on local projections. The shaded area reflects a 90% confidence band around the point estimate.

Figure 4: Colombia - Response to interest rate change



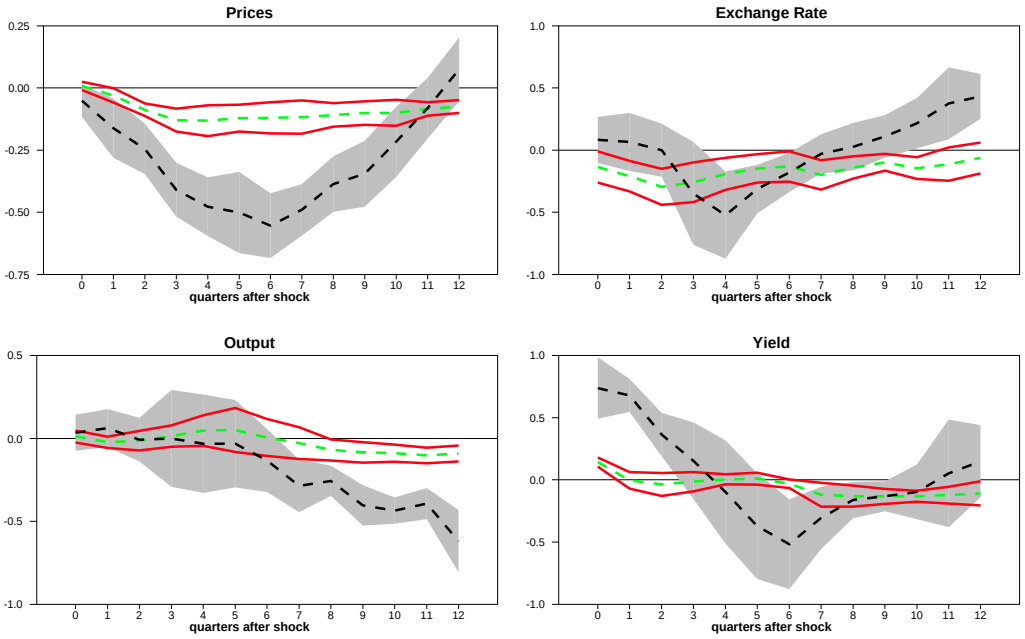
Notes: The dotted line is the impulse response based on local projections. The shaded area reflects a 90% confidence band around the point estimate.

Figure 5: Philippines - Response to interest rate change



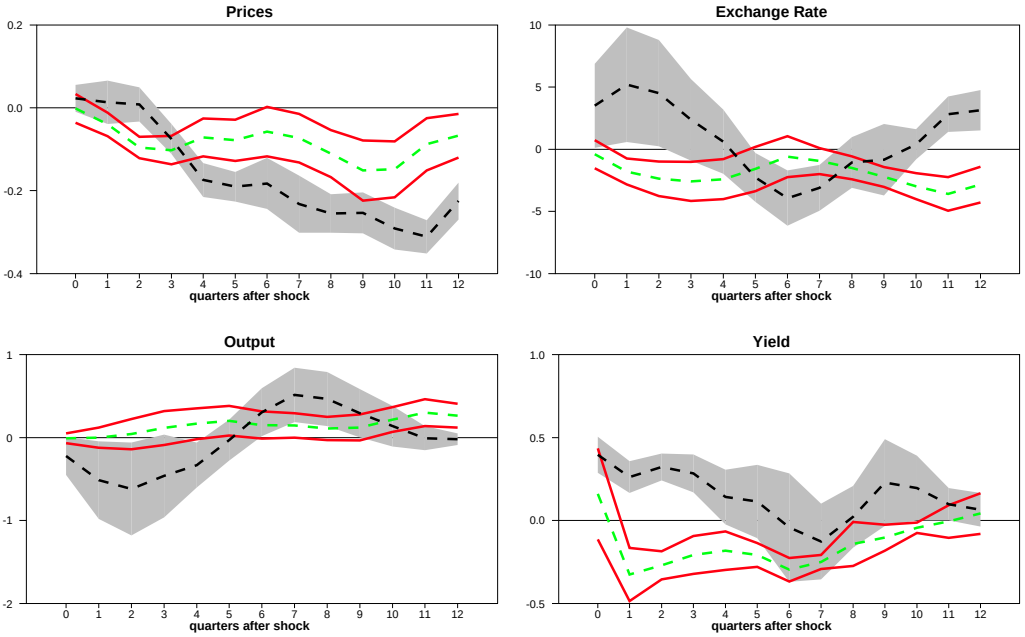
Notes: The dotted line is the impulse response based on local projections. The shaded area reflects a 90% confidence band around the point estimate.

Figure 6: Kenya - State-dependent response to interest rate change



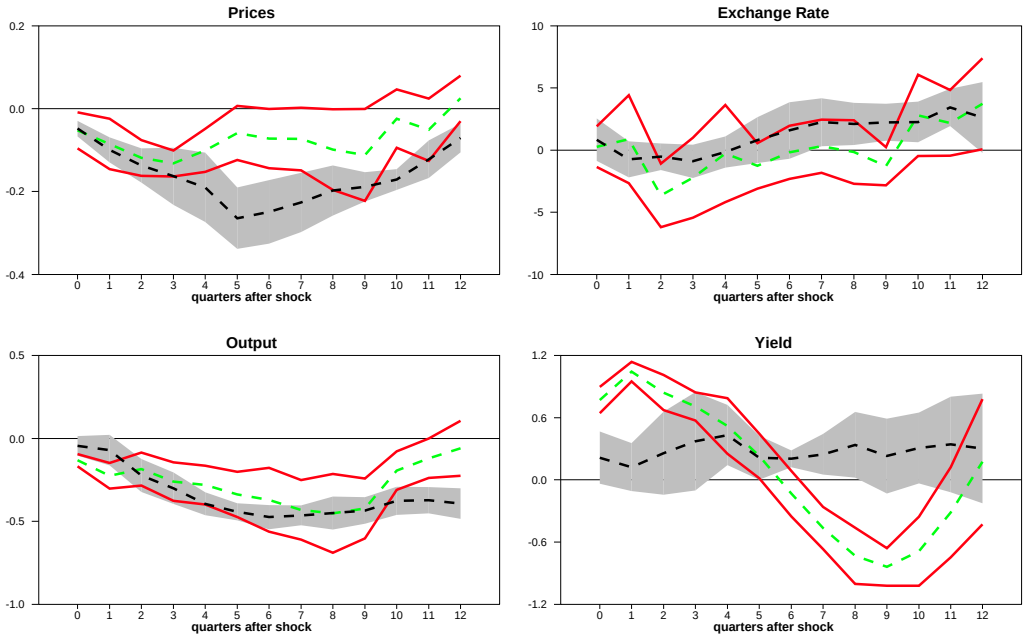
Notes: The green (black) dotted line is the impulse response based on local projections in regime I (II). The grey shaded area reflects a 90% confidence band around the point estimate in state I and the red solid lines reflect the confidence band in state II.

Figure 7: Mexico - State-dependent response to interest rate change



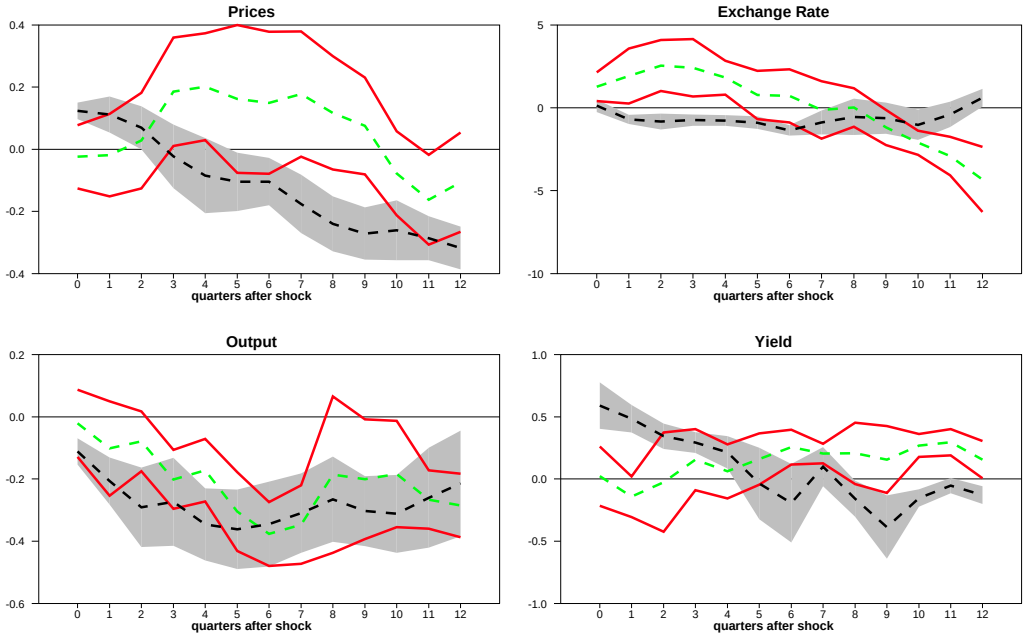
Notes: The green (black) dotted line is the impulse response based on local projections in regime I (II). The grey shaded area reflects a 90% confidence band around the point estimate in state I and the red solid lines reflect the confidence band in state II.

Figure 8: Colombia - State-dependent response to interest rate change



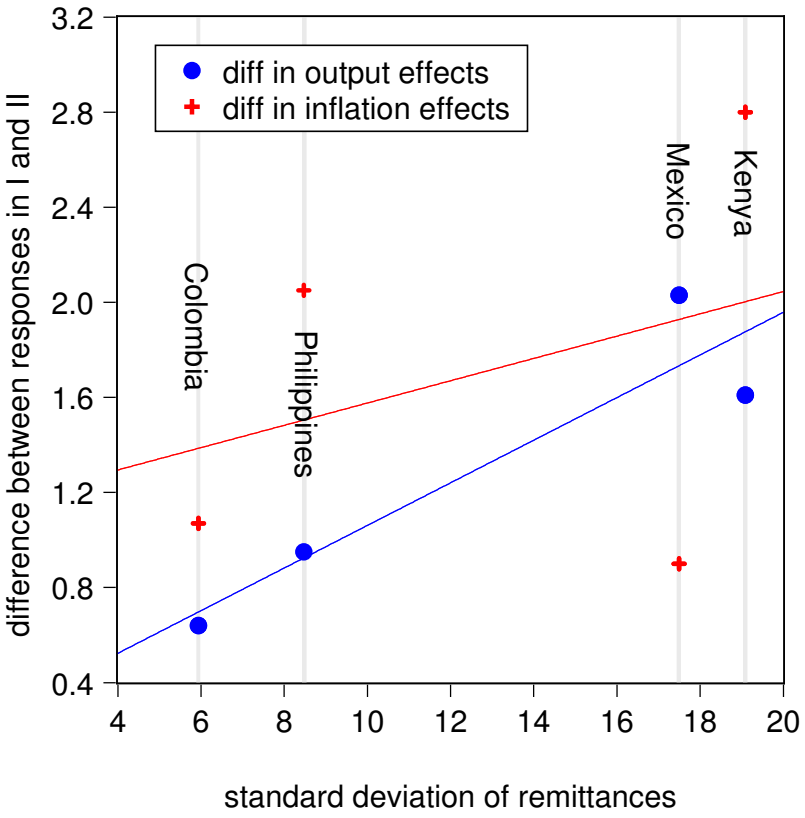
Notes: The green (black) dotted line is the impulse response based on local projections in regime I (II). The grey shaded area reflects a 90% confidence band around the point estimate in state I and the red solid lines reflect the confidence band in state II.

Figure 9: Philippines - State-dependent response to interest rate change



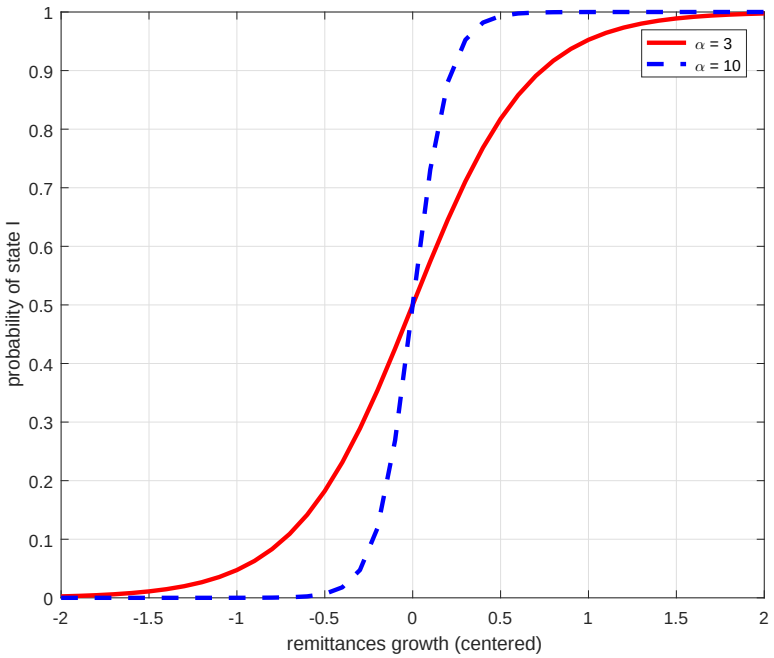
Notes: The green (black) dotted line is the impulse response based on local projections in regime I (II). The grey shaded area reflects a 90% confidence band around the point estimate in state I and the red solid lines reflect the confidence band in state II.

Figure 10: Summary of baseline results



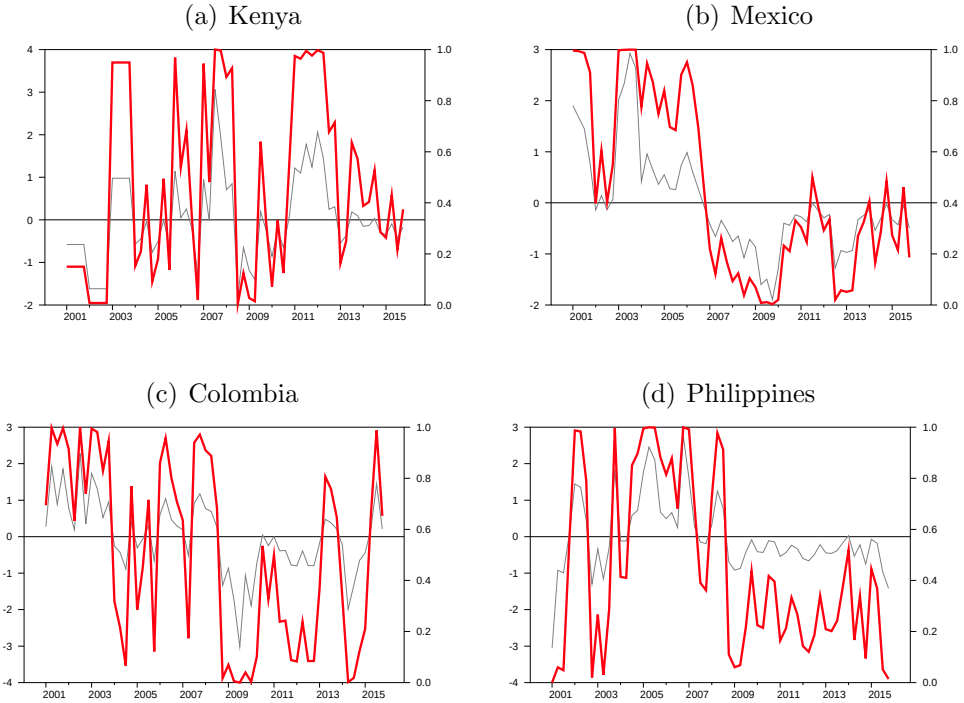
Notes: The scatter plot shows the differences in the cumulative output effects (blue dots) and inflation effects (red crosses). In both cases, the difference is calculated as the response in state I minus the response in state II. The differences are plotted against the sample standard deviation of remittance inflows.

Figure 11: Transition functions



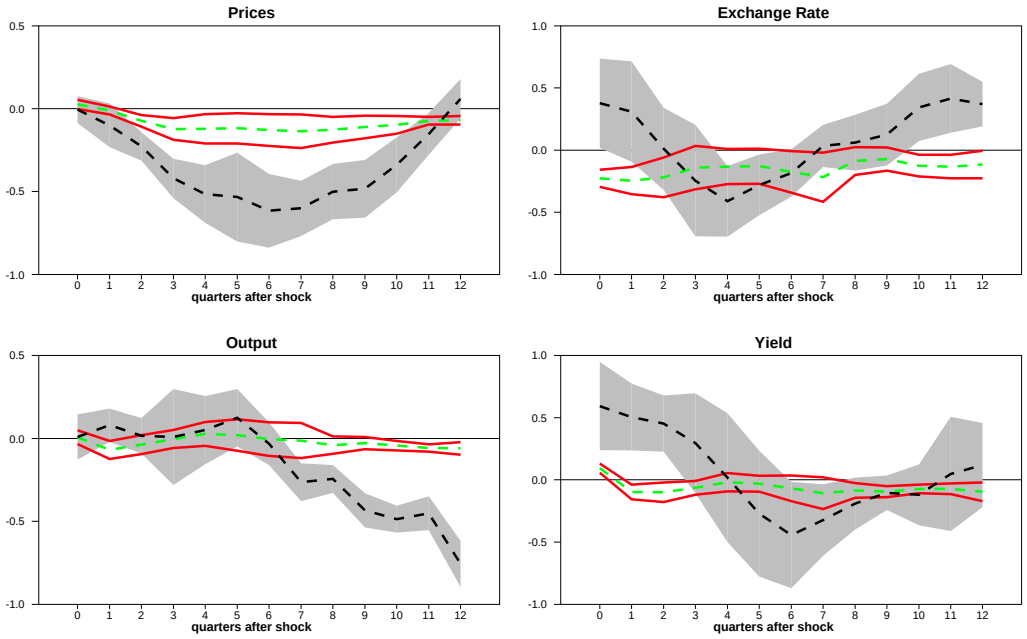
Notes: Calibrated logistic transition functions for alternative values of α. The horizontal axis measures centered and standardized remittances growth and the vertical axis depicts the probability of being in state I.

Figure 12: Probability of high-remittances inflow state



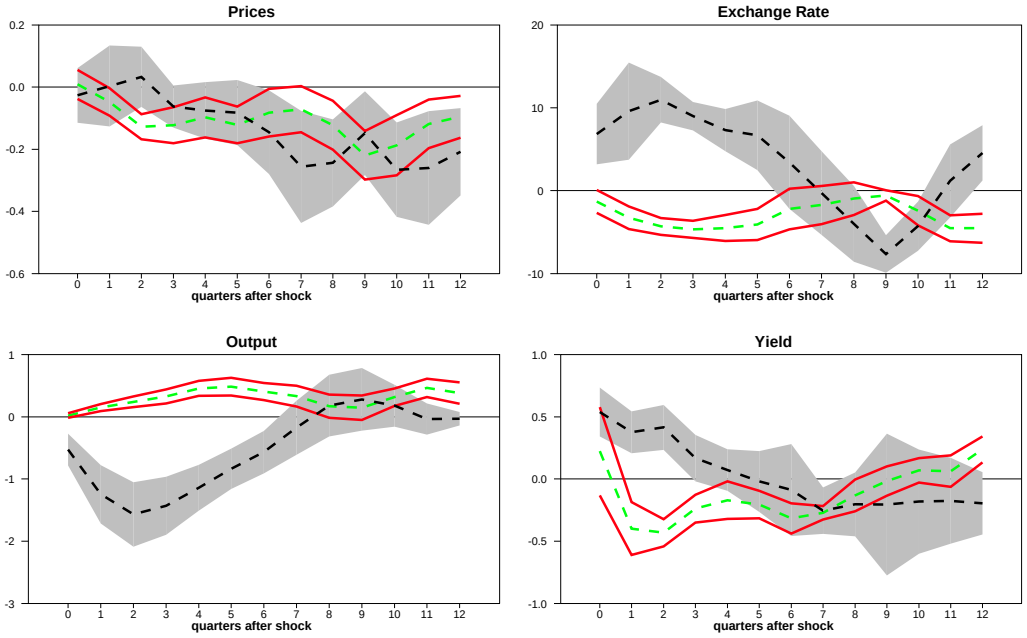
Notes: The red line is the probability of being in state I (right scale). The grey line is the quarterly year-on-year growth rate of remittances (left scale).

Figure 13: Kenya - State-dependent response to interest rate change from STLP



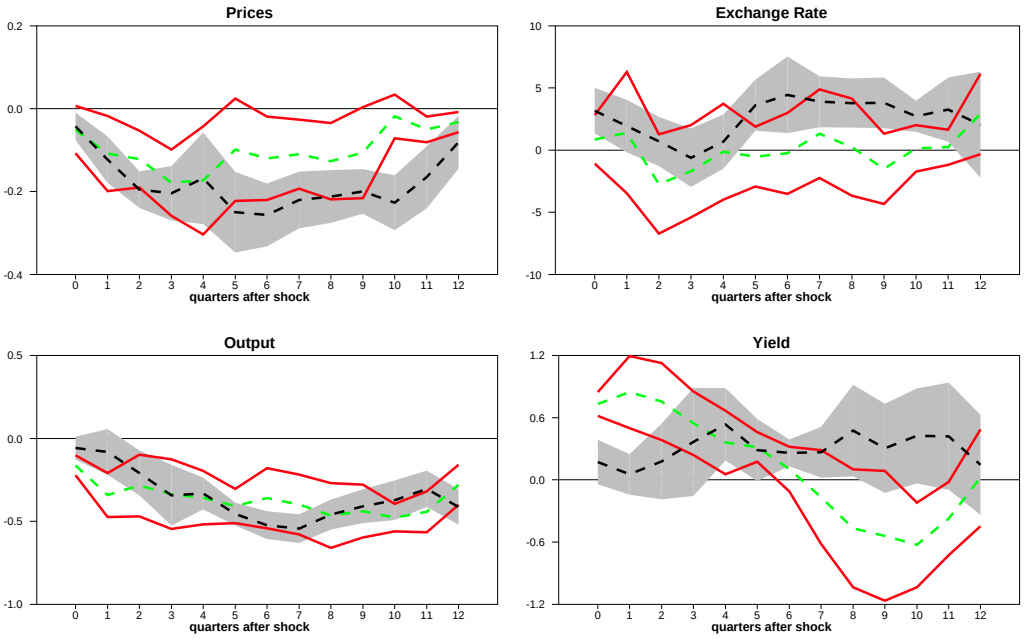
Notes: The green (black) dotted line is the impulse response based on smooth-transition local projections in regime I (II). The grey shaded area reflects a 90% confidence band around the point estimate in state I and the red solid lines reflect the confidence band in state II.

Figure 14: Mexico - State-dependent response to interest rate change from STLP



Notes: The green (black) dotted line is the impulse response based on smooth-transition local projections in regime I (II). The grey shaded area reflects a 90% confidence band around the point estimate in state I and the red solid lines reflect the confidence band in state II.

Figure 15: Colombia - State-dependent response to interest rate change from STLP



Notes: The green (black) dotted line is the impulse response based on smooth-transition local projections in regime I (II). The grey shaded area reflects a 90% confidence band around the point estimate in state I and the red solid lines reflect the confidence band in state II.

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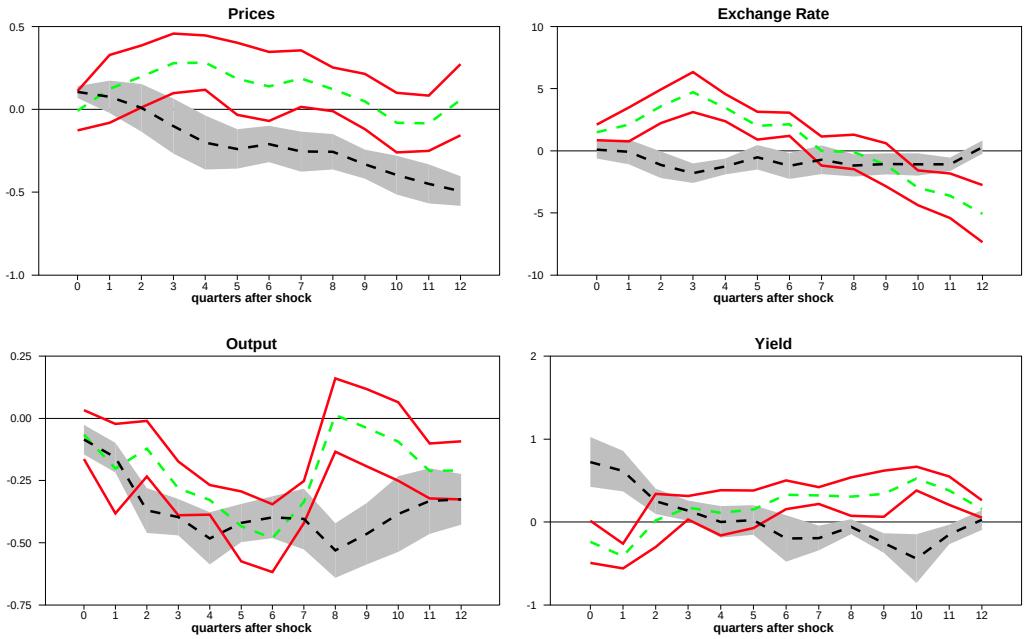
Figure 16: Philippines - State-dependent response to interest rate change from STLP



Notes: The green (black) dotted line is the impulse response based on smooth-transition local projections in regime I (II). The grey shaded area reflects a 90% confidence band around the point estimate in state I and the red solid lines reflect the confidence band in state II.

Table 1: Descriptive statistics on remittance inflows

Kenya	Mexico	Colombia	Philippines
total inflows (2015, in mil USD)			
1,560	26,233	4,680	28,483
as share of GDP (2015)			
2.5%	2.3%	1.6%	9.8%
main source countries			
UK (33%)	USA (98%)	USA (31%)	USA (34%)
USA (30%)	CAN (<1%)	VEN (30%)	UAE (12%)
TAN (7%)	ESP (<1%)	ESP (15%)	KSA (11%)
CAN (6%)		ECU (6%)	CAN (7%)
UGA (5%)		CAN (2%)	MAS (6%)

Notes: The table shows the volume of remittance inflows in absolute terms as well as relative to GDP. We also give the main source countries for inflows. All data comes from the Worldbank.

Table 2: Cumulative impulse response functions for alternative models

	Prices		Output	
	I	II	I	II
Kenya				
linear	−2.05 [−3.30,−0.80]		−0.80 [−2.00,0.39]	
baseline	−1.12 [−1.66,−0.59]	−3.92 [−5.33,−2.50]	−0.28 [−1.13,0.57]	−1.89 [−3.82,0.05]
domestic cycle	−2.24 [−3.57,−0.91]	−2.29 [−3.62,−0.96]	−0.80 [−2.15,0.55]	−1.38 [−2.81,0.04]
U.S. cycle	−2.26 [−3.82,−0.70]	−1.74 [−2.94,−0.54]	−1.44 [−3.19,0.30]	−0.75 [−1.56,0.05]
Mexico				
linear	−0.21 [−0.69,0.26]		−0.15 [−1.53,1.23]	
baseline	−1.02 [−1.61,−0.42]	−1.92 [−2.48,−1.36]	1.55 [−0.30,3.41]	−0.48 [−4.38,3.42]
domestic cycle	−0.06 [−0.63,0.51]	−0.50 [−1.17,0.17]	−1.01 [−3.04,1.03]	−0.78 [−3.27,1.70]
U.S. cycle	−1.74 [−2.27,−1.21]	−0.14 [−0.67,0.38]	3.07 [1.05,5.09]	−0.59 [−1.95,0.77]
Colombia				
linear	−1.62 [−2.31,−0.93]		−4.07 [−4.92,−3.22]	
baseline	−0.98 [−1.77,−0.18]	−2.05 [−2.69,−1.42]	−3.41 [−5.02,−1.80]	−4.05 [−4.99,−3.11]
domestic cycle	−1.74 [−2.24,−1.24]	−1.35 [−2.21,−0.50]	−3.44 [−4.26,−2.62]	−4.84 [−6.34,−3.34]
U.S. cycle	−1.66 [−2.67,−0.64]	−1.58 [−2.21,−0.95]	−3.18 [−4.92,−1.45]	−3.50 [−4.26,−2.73]
Philippines				
linear	−0.32 [−1.35,0.71]		−2.50 [−3.56,−1.44]	
baseline	0.81 [−1.21,2.83]	−1.24 [−2.22,−0.26]	−2.44 [−4.06,−0.82]	−3.39 [−4.82,−1.96]
domestic cycle	−0.57 [−1.68,0.53]	−1.38 [−2.89,0.13]	−3.82 [−5.66,−1.97]	−2.03 [−3.15,−0.91]
U.S. cycle	0.81 [−1.15,2.78]	−0.32 [−1.22,0.58]	−3.01 [−4.47,−1.56]	−3.08 [−4.36,−1.79]

Notes: The table reports impulse response functions which are accumulated over 12 periods. The confidence band (in brackets), is the cumulative upper and lower bound, respectively, over 12 periods. "Domestic cycle" refers to a model which is in state I if the domestic GDP growth rate is below the median. "U.S. cycle" is a model which is in state I if U.S. output growth is above its median. "Linear" and "baseline" are the models from section 3.

Conferences with Review Process:

- *Central Bank of Kenya Research Department Seminar*, Nairobi, Kenya, December 13, 2016.
- *UNU-WIDER Conference on Migration and Mobility*, Accra, Ghana, October 5-6, 2017.
- *CSAE Conference 2018: Economic Development in Africa*, Oxford, United Kingdom, March 18-20, 2018.

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Chapter 4

Are Remittances Cyclical? The Role of South-South Flows

Are Remittances Cyclical? The Role of South-South Flows

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Abstract

This paper revisits the cyclical properties of remittance inflows into developing economies. The literature is inconclusive about whether remittances are procyclical or countercyclical and finds many countries for which remittance inflows are acyclical. We document a pattern in remittance flows that has not been studied before: for a large cross-sectional data set, remittances are procyclical for some countries and countercyclical for others. When we distinguish North-South from South-South flows, we show that a larger share of remittance inflows stemming from other low income countries significantly reduces the cyclicality of flows. Thus, the large share of countries with acyclical remittance inflows can be explained by South-South flows.

Keywords: Remittances, capital flows, business cycle, migration, developing countries,

JEL classification: F2, F4

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1 Introduction

Owing to their scale and properties, international migrants' remittances have attracted a lot of attention from policy makers and researchers. Remittances rank second after FDI in terms of capital flows to developing countries, exceeding both official development assistance and portfolio investment. According to the latest edition of the World Bank's Migration and Development Brief released on October 3, 2017, remittances to low and middle income countries are on course to recover in 2017 after two consecutive years of decline.[1] According to World Bank estimates, officially recorded remittances to developing countries are projected to grow by 4.8% to US$450 billion for 2017. The recovery in remittance flows is attributed to relatively stronger growth in advanced economies.

Remittances are regarded as a lifeline for many developing countries. This is because remittances provide a relatively stable source of capital inflows that foster economic development and potentially also smooth the business cycle. The latter effect of remittances hinges on their cyclical nature. Countercyclical remittance inflows allow households in low income countries to smooth consumption despite adverse income shocks resulting from global changes in food prices, natural disasters, political turmoil, drought and many other factors. Procyclical remittances, in contrast, exacerbate income fluctuations. Hence, a large branch of research investigates the cyclical properties of remittance inflows.

Theoretically, there are arguments for countercyclical as well as procyclical remittances, respectively. Altruistic motives of migrants, which are often considered the main driver of remittances, lead to financial support for their families living in the home country. The flows resulting from altruistic motives should be countercyclical, i.e. they should increase if economic hardship hits the home economy. Income and employment in the host countries give migrants the necessary means to transfer a fraction of their income to their home economy. Therefore, migrants are more likely to transfer money during economic expansions compared to downturns. If income in the home economy is positively correlated with income in the host economy, the resulting flow of remittances could also become procyclical. The existing empirical literature is inconclusive about the cyclical nature of remittances. While some prominent contributions highlight the countercyclical nature of remittances, and hence stress the income smoothing effect of remittance inflows, other papers suggest that remittances are procyclical.

[1] Migration and Development Brief is a publication of the World Bank which reports on global trends in migration and remittance flows, major policy developments, Sustainable Development Goal (SDG) indicators for reducing remittance costs and recruitment costs.

In this paper, we offer an explanation to the inconclusive findings from large cross-country datasets. Our explanation rests on the importance of South-South remittances as opposed to North-South remittances. From the migration literature we know that South-South migration is an important part of global migration. Table (1) provides information of the global stock of migrants and a breakdown into South-North and South-South migration. In 2015, the year for which we obtain latest available data, 40% of the migrants from low income countries indeed reside in other low income countries. The current stock of migrants from low income home countries residing in low income host countries amounts to 68 million persons. The remaining 60% of migrants moved to high income countries. Only 9% of migrants from high income countries live in low income countries. Hence, South-South migration is quantitatively a very important phenomenon.

Migrants from low income economies that now live in other low income economies might lack the resources to remit funds to their home economy. In the aggregate, a large share of remittances from other low income countries should lead to overall remittance inflows which, due to their lack of correlation with domestic income, are neither countercyclical nor procyclical, but acyclical. The existing literature typically controls for income in the host economy, but does not look at the share of remittance inflows to low income countries originating in other low income economies. This variable is our key to understand the cyclicality puzzle of remittances.

We explore the cyclical nature of remittances using a dataset with annual frequency composed of 101 countries that spans the period 2001 to 2015. We document the inconclusive cyclicality of remittance inflows for this large dataset. Our central contribution is an attempt to explain this pattern of the data. We distinguish between North-South flows and South-South flows. For each receiving country, we calculate the share of remittances stemming from other low income countries. We include this variable as an additional explanatory variable in a regression which aims at explaining the cyclicality of remittances. We find that for a higher share of flows from low income countries the cyclicality of remittances disappears. Hence, the empirical puzzle mentioned before can be solved once South-South remittance flows are taken into account.

Although a few prior studies explore the subject of South-South flows, to the best of our knowledge, there is no comprehensive study on the cyclical impact of South-South remittance flows. Ratha and Shaw (2007) investigate bilateral migration data and detail out some working hypotheses on the determinants and socioeconomic implications of South-South migration as well as South-South remittance flows. However, they do not mention the cyclicality impact of South-South flows.

One caveat remains the fact that the share of remittances from low income countries might itself be affected by the cyclical nature of remittances. Suppose remittances fail to smooth income shocks in migrants' home economies. After an extremely large income shock, this failure might trigger cross-border migration. Hence, the share of inflows could incorporate some endogenous feedback from previous remittance inflows. In this paper, we address this concern through an instrumental variables (IV) approach. We instrument the share of flows from low income countries by a dummy that reflects the colonial history of a remittances-receiving country. The existence of a colonial motherland is a good predictor for a large share of remittance inflows originating in high income economies. The IV regression supports our main argument.

This paper is organized as follows. Section two surveys the existing literature on the cyclical nature of remittances. Section three explains the data and the estimated model. The main results are discussed in section four. Section five offers results from an instrumental variables estimation and section six concludes.

2 Related literature

From the vast amount of literature available on remittances, we focus on the branch of the literature which revolves around the cyclicality of remittances with respect to domestic macroeconomic variables. Up to now, the evidence regarding the cyclical properties of remittance inflows is mixed.

One of the key contributions is Frankel (2011). The author provides evidence of the countercyclical nature of remittances by expounding the smoothing hypothesis, whereby remittances are countercyclical with respect to income in the worker's country of origin and, as a flip side, procyclical with respect to income in the migrant's host country. According to Frankel's econometric results, remittances constitute a preeminently valuable component of aggregate capital inflows in domestic downturns or when international investors flee the country. Likewise, Buch and Kuckulenz (2010) support the notion of countercyclical nature of remittance inflows. They bring this into effect by focusing on the macroeconomic determinants of remittances and on differences in these determinants between remittances and other capital flows.

Bugamelli and Paterno (2009) evaluate whether workers' remittances reduce the probability of current account reversals. Their results suggest that remittances indeed strengthen financial stability by reducing the likelihood of large current account adjustments. Their findings further point to the fact that large, cheap and stable flows of workers' remittances from a large panel of emerging and develop-

ing economies exhibit these features. These authors investigate a cross section of about 60 emerging and developing countries over the period 1980-2003 and find that the volatility dampening effect is larger in low income countries where investment opportunities are limited and consumption needs are strong. In the same vein, Machasio (2016) evaluates the role of remittance flows to developing countries in the aftermath of sovereign defaults and finds evidence that remittances are resilient and consequently facilitate an economic stabilization of recipient economies after a a default. Additionally, to support the hypothesis that remittances are countercyclical, Combes and Ebeke (2011) analyze the relationship between migrants' remittances and consumption instability. Their econometric results suggest that remittance-receiving countries exhibit on average lower consumption instability.

De et al. (2016) examine the behavior of remittances over the business cycle and their potential to act as a stabilizer during periods of high business cycle volatility. Their findings reveal that remittances are relatively stable and countercyclical, thus ultimately implying that remittances have the potential to make a critical contribution in smoothing consumption in the face of economic adversity.

While these authors strengthen the case of remittances being countercyclical, others find more mixed results. Lueth and Ruiz-Arranz (2008) use a data set of bilateral remittance flows to evaluate the determinants of workers' remittances. They find mixed motives associated with remittances. According to their findings, altruism seems not to be the prime motive because as depicted by their results, remittances do not increase in the aftermath of natural disasters. As a consequence of being procyclical, they dwindle when exports weaken and GDP growth slows. They also falter when the investment climate worsens and do not seem to respond to adverse shocks at home.

Supporting mixed evidence, Sayan (2006) studies 12 developing and emerging countries and does not find general countercyclicality of remittance flows. Model-based evidence provided by Durdu and Sayan (2010) is also inconclusive as the relative size of opposite effects on the cyclical nature of remittances is unclear. For remittance flows to Mexico and Turkey, they find opposite cyclical characteristics. Remittances dampen business cycles in Mexico whereas they do indeed amplify cycles in Turkey. Mughal and Ahmed (2014) examine the business cycle properties of remittances to four South Asian economies which are considered principal economies within the region. Remittances to India and Pakistan are mostly acyclical with respect to host region business cycles and countercyclical with respect to home output. On the other hand, the opposite is true for Bangladesh and Sri Lanka as remittance flows in these smaller economies are found to be mainly procyclical.

Although the above mentioned papers have explored the relationship between remittances and domestic macroeconomic variables, none of them has explicitly considered this in the light of North-South and South-South flows. In this paper, we argue that the role of South-South flows is a key to understand the variety of findings regarding the cyclical properties of remittances.

3 Data

We take into account a large set of countries and distinguish North-South from South-South remittance flows. The choice of countries in our sample and the corresponding sample period, which spans from 2001 to 2015, are dictated by data availability. The selection of countries is reported in Table (2).

3.1 Construction of variables

To put forward our main point, we use data on the source countries of remittance flows and a summary statistic for the cyclical nature of remittances. We first construct a measure of the sources of remittance inflows. To construct this indicator, which we refer to as *share*, we use bilateral remittance data availed by the World Bank. A large matrix summarizes the bilateral volume of flows for each country in a given year. Based on the matrix of bilateral flows in 2014, we aim at distinguishing South-South from North-South flows. To facilitate this process, we use the World Bank classification to distinguish between high-income economies and low and middle income countries, respectively. The variable *share* describes the share of remittance inflows of each country that is received from low-income countries. If a certain country receives more than half of its remittances from high income countries, then such flows are considered North-South remittance flows. The converse holds if more than half of remittance flows are received from other low and middle income countries thus giving rise to South-South flows. Table (2) also reports this share for each country in the sample in 2014. While the flows of remittances and the relative role of specific source countries vary over time, the share of flows from low income countries is relatively stable, such that using the latest available flow matrix from 2014 does not imply a large loss of information. The mean (median) country obtains 34% (23%) of its remittance inflows from low income countries. Lesotho is the country with the highest share of inflows from other low income economies (99%), while Jamaica is the country which receives all of its remittance inflows from high income countries.

Our second measure describes the cyclical nature of remittance inflows. We define the cyclicality of remittance inflows by the unconditional correlation between the annual percentage change in real GDP of the receiving country and the first difference of annual remittance inflows relative to GDP. Hence, our measure is $corr\left(\Delta log(GDP), \Delta\frac{REM}{GDP}\right)$.[2] The correlation is calculated over the period 2001 to 2015 with GDP data taken from the World Bank. Suppose relative to GDP, remittances increase while the growth rate of real GDP is negative. In this case, remittances are considered countercyclical. If remittances fall in a year in which GDP also falls, remittances are procyclical.

The cross-country mean of this correlation is only 0.05 with a minimum of -0.67 and a maximum of 0.77. Hence, there is no clear pattern in the data as to whether remittances inflows are procyclical or anticyclical. In fact, this evidence suggests that on average remittances are acyclical. The aim of this paper is to explain the missing cyclicality in remittance inflows. The correlations are described in Figure (1), which presents a histogram of $corr\left(\Delta log(GDP), \Delta\frac{REM}{GDP}\right)$. We see that the data does not suggest a clear-cut characterization of remittances being procyclical or countercyclical, respectively.

We now take a step back and note that the data behind the histogram in Figure (1) represents a corner solution only. If we take into account the share of remittances from low-income countries, both positive and negative correlations become much smaller. To illustrate this point, we use a scatter plot, see Figure (2), which shows our measure of cyclicality plotted against the share of inflows from other low-income countries. The figure and the histogram presented before show the same property of the data: both positive and negative correlation are almost equally likely.

The new dimension we add to this literature becomes apparent if we allow for the share of remittance from low income countries to differ from zero. We find that for a low share of inflows from low income countries, remittance inflows are either procyclical or anticyclical. However, a striking finding emerges for countries that receive a large share of their remittance inflows from low-income countries: in this case the degree of procyclicality or countercyclicality vanishes completely and remittance are acyclical. Thus, the higher the share of remittance inflows from low income countries, the more the cyclicality of remittances vanishes.

This finding is highlighted by two regression lines included in Figure (2). Each line reflects a simple OLS regression of the correlation on the share from low-income countries. One is drawn for all countries that exhibit procyclical remittance in-

[2] Alternative measures of the cyclical part of GDP such as the linearly detrended logarithm of real GDP lead to virtually identical results and are not reported here.

flows and another regression line is plotted for countries' countercyclical remittances. While the slope of the former is negative, the slope of the latter is positive. Since cyclicality disappears for each subgroup of countries, we cannot detect a global connection between cyclicality and the share of South-South flows.

As regards the quality of the data, a caveat is warranted: the magnitude of remittance flows is notoriously prone to measurement errors. While official statistics provide a reasonable approximation to remittance inflows and outflows to and from advanced and medium-income countries, the quality of the data sharply deteriorates for low-income countries. Since the key variable for our argument is the share if inflows from low income countries, concerns about data quality should be kept in mind. It is possible that we underestimate the share from low-income countries since these transfers work though informal channels and are likely to be missed by official statistics.

3.2 Regression equation

To study the connection between cyclicality and the source of remittance flows more formally, we run an OLS regression of $corr\left(\Delta log(GDP), \Delta\frac{REM}{GDP}\right)$ on $\widehat{share}$ and two control variables. The control variables are the log of per-capita GDP and the log of overall remittance inflows relative to GDP. The first control variable captures the level of economic development, while the latter reflects the overall magnitude of remittance inflows. In an alternative specification, we distinguish procyclical and countercyclical remittance inflows and, thus, allow the coefficients to be different according to the cyclicality of remittance inflows.

As *share* is bounded between zero and one, we use a logistic transformation and use the resulting $\widehat{share}$ as the explanatory variable in the regression

$$\widehat{share} \equiv \log\left(\frac{share}{1-share}\right).$$

Although in principle the correlation is also bounded between minus one and plus one, we do not transform it in a way similar to *share*. This is because Figure (2) shows that none of the observed correlations is actually close to one or minus one. The cross-sectional regression is the following

$$corr\left(\Delta\log(GDP), \Delta\frac{REM}{GDP}\right) = \alpha + \beta\widehat{share} + \gamma\mathbf{X}' + \varepsilon,$$

where the vector $\mathbf{X}$ collects the control variables. The estimated coefficient on $\widehat{share}$, β, is the one we are mostly interested in. In an extension to be discussed below,

we differentiate an estimated β coefficient for countries with a positive remittances-growth correlation and countries with a negative correlation.

4 Results

Table (3) contains the results for the baseline model. The first two columns report the estimates of the model in which we do not distinguish between positive and negative correlations. In both cases, the coefficient on $\widehat{share}$ is statistically not different from zero. Thus, there is no systematic relationship of the cyclicality of remittances with the share from low-income countries. This is not surprising as a positive slope coefficient in a linear regression would imply that a country with countercyclical remittances would, for a growing share from low income countries, exhibit procyclical inflows. Therefore, we now let the coefficient on $\widehat{share}$ differ between countries with a positive correlation and countries with a negative, see columns III and IV. We obtain coefficient estimates which are significantly different from zero. The coefficient on $\widehat{share}$ for countries with procyclical remittances is -0.066. This implies that for a larger fraction of inflows from low income countries, the degree of procyclicality falls and eventually disappears. For countries with countercyclical inflows, the coefficient on $\widehat{share}$ is 0.071. If the share from low-income countries increases, the correlation will decrease such that countercyclicality eventually disappears.
In Table (4), we allow the coefficient on the measure of cyclicality to be different across regions. For countries with procyclical inflows, we find that for all regions the procyclicality disappears with larger inflows from low income countries. The coefficient is significantly negative for countries in Africa, Asia and Latin America, respectively. Interestingly, the absolute value of the coefficient is larger in Asia and Latin America than in Africa. For countries with countercyclical inflows, the estimated coefficient is significantly positive if the country is located in Asia and Latin America. For Africa, however, the estimated coefficient is not significant.

5 Instrumental variables estimation

In the previous section, the explanatory variable, $\widehat{share}$, has been taken as given. It could be argued, however, that the share from low-income countries is not completely exogenous. This is based on the idea that the share of remittances from low-income countries might itself be depending on the properties of aggregate remittance inflows and their interaction with GDP growth. Suppose a low income country receives remittance inflows which are procyclical. Thus, a depression or a fall in income due

to a natural disaster is made worse through a drop in remittance inflows. This could trigger cross-border migration to neighboring countries, which are most likely also low-income countries. Countercyclical inflows might stabilize the home economy and could lead to the return of migrants. Hence, the share of remittance flows from low-income countries might at least partly be endogenous.

We now want to address this issue by estimating a Two-Stage Least Squares regression. The aim is to use an appropriate instrument for $\widehat{share}$. The instrument should be correlated with the share of flows from low-income countries and exogenous with regard to the correlation of remittances inflows with GDP growth. To find an instrument, we exploit the fact that many developing countries have been colonies of high income European economies. The underlying idea is that a country which has been a colony of, say, France, is more likely to receive a large share of remittances from France or other high income economies. A country without ties to former colonial motherlands, in contrast, is more likely to receive a large share of remittance inflows from other low-income countries.

Our instrument is a dummy variable that is one if a country has been a colony of a European economy after the second world war and zero otherwise. Since the dummy variable reflects colonial history, it is, by definition, exogenous with regard to contemporaneous remittance flows. The first-stage regression relates the share from low-income countries to a constant and the instrumental dummy. The coefficient in the first stage-regression is -0.107, which is significant at the 5% level. Hence, being a former colony implies a significantly smaller share of remittance inflows from low income countries. Countries which have been a colony on average have a one percentage point lower share of remittance inflows from low income countries. Since we need to estimate two parameters on $\widehat{share}$, one for positive and one for negative correlations, we construct the instrument separately for countries with procyclical remittances and for countries with countercyclical remittances.

The results of the two-state least squares regression is shown in Table (5). While $\widehat{share}$ is not statistically significant for countries with procyclical remittance inflows, it is significant for countries with countercyclical inflows. The estimated coefficient is 0.21, such that countries with countercyclical remittance inflows exhibit less countercyclicality if the share of remittances from low income countries increases. In sum, the results support the evidence from least squares obtained before.

6 Conclusions

This paper studies the cyclical nature of remittance flows to developing countries and introduces a new perspective on why researchers failed to establish a consensus about whether remittances are procyclical or countercyclical. We show that the share of remittances originating in other low-income countries plays a major role in explaining cyclicality: the larger the share of flows from low-income countries, the less remittances exhibit a systematic relationship with income in the receiving country. Since migrants to other low income countries typically lack the resources to respond to income shocks in their home economies, their presence reduces overall cyclicality.

These findings have important policy implications, mostly because some of the favorable properties assigned to remittance inflows indeed depend on whether they are countercyclical. Remittances cannot serve as an insurance mechanism against income drops, stemming, among other factors, from natural disasters, financial crisis or political turmoil, when most inflows come from other low income countries. Therefore, when judging the potential of remittance inflows as a source of income and consumption smoothing, respectively, researchers and policymakers have to account for the source countries of remittances.

It is widely accepted that countercyclical remittance flows to developing countries could considerably contribute towards stabilization policies in economic downturns. To attain the aforementioned objectives, developing countries should adopt policies that are likely to strengthen remittance flows and enhance their consumption smoothing benefits. In this regard, focusing on reducing remittance costs and strengthening the financial infrastructure that supports remittances would be key policy issues. This would enable South-South migrants to channel funds to their home country. The benefits associated with remittance cost reduction policy intervention is threefold: first, it will create a channel through which resources can be transferred by low income migrants to their families back home. Second, it will increase flows through formal financial services, especially banks. Third, it will improve financial access for the low income in developing and emerging market countries.

In contrast to fees on large cross-border transfers, the remittance costs of small, personal transfers are high. This constitutes a severe constraint on both the sending migrant and the receiving home economy. Reducing transaction fees will therefore increase disposable income of low income migrants and increase incentives to remit as well as increase annual remittance flows to developing countries. This will eventually also contribute to strengthening the role of remittances as a countercyclical

stabilization tool.

It is important to implement policies that build on alternative remittance channels. These would be an alternative to mainstream banks and money transfer agencies. For instance, remitting funds using mobile phones has gained popularity worldwide because mobile payments provide a quick, cheap and accessible option, and is considered particularly important for remote areas.

A second implication pertains to domestic economic policies in the receiving countries. Policies that encourage countercyclical remittance inflows should be designed in order to benefit from remittance inflows. One way to achieve this would be to adopt countercyclical macroprudential policies directed towards capital inflow such as countercyclical reserve requirements.

Multinational institutions and development initiatives promote remittances as a vehicle for economic stability and growth. It should be recognized that not all remittances are created equal - it is typically only the fraction of remittance inflows from high income countries that contributes to economic stabilization.

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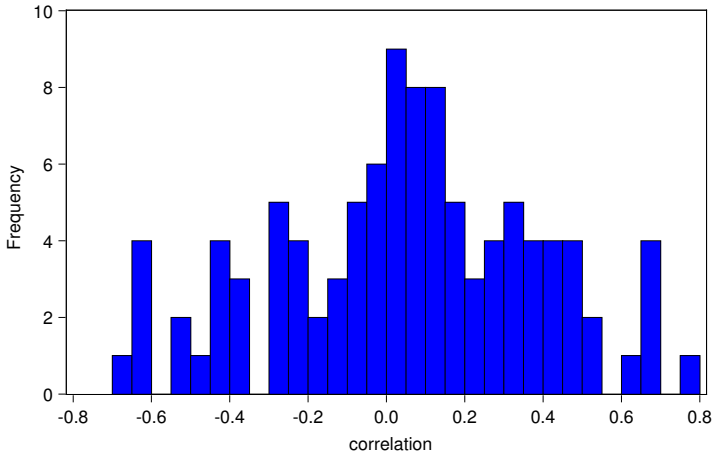
Table 1: Migrant stocks

	migrants in		
migrants from	low income countries	high income countries	total
low income countries	68 mio. (40%)	102 mio. (60%)	170 mio. (100%)
high income countries	9 mio. (22%)	33 mio. (78%)	43 mio. (100%)
total	77 mio. (36%)	136 mio. (64%)	214 mio. (100%)

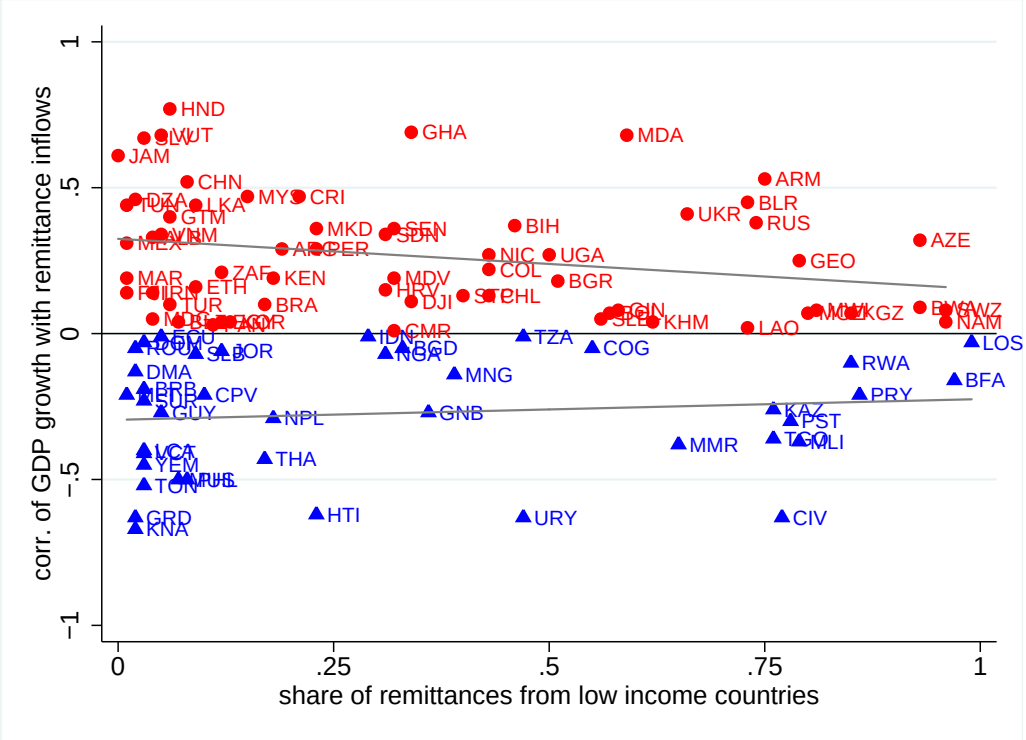
Notes: The data comes from the United Nations' "Trends in International Migrant Stock" 2015 database (table 16).

Figure 1: Cross-country distribution of correlation between GDP growth and remittance inflows



Notes: Histogram for $corr\left(\Delta log(GDP), \Delta \frac{REM}{GDP}\right)$

Figure 2: Correlation of GDP with remittance inflows as a function of the share of remittances from low-income countries



Notes: Scatter plot for $corr\left(\Delta log(GDP), \Delta \frac{REM}{GDP}\right)$ and $\widehat{share}$. Countries in blue (triangles) exhibit countercyclical remittance inflows. Countries in red (dots) exhibit procyclical remittance inflows. We also plot one regression line for countries with $corr\left(\Delta log(GDP), \Delta \frac{REM}{GDP}\right) > 0$ and one for $corr\left(\Delta log(GDP), \Delta \frac{REM}{GDP}\right) < 0$

Table 2: Sample countries

country	share	country	share	country	share
Lesotho	0.99	Chile	0.43	Sri Lanka	0.09
Burkina Faso	0.96	Colombia	0.43	Philippines	0.08
Swaziland	0.96	Nicaragua	0.42	China	0.08
Namibia	0.96	Sao Tome-Principe	0.40	Belize	0.07
Azerbaijan	0.93	Mongolia	0.39	Mauritius	0.07
Botswana	0.93	Guinea-Bissau	0.36	Turkey	0.06
Paraguay	0.86	Ghana	0.34	Guatemala	0.06
Kyrgyz Republic	0.85	Djibouti	0.34	Honduras	0.06
Rwanda	0.84	Bangladesh	0.33	Ecuador	0.05
Malawi	0.80	Senegal	0.32	Vietnam	0.05
Mozambique	0.79	Maldives	0.32	Vanuatu	0.05
Georgia	0.79	Cameroon	0.31	Guyana	0.04
Mali	0.78	Croatia	0.31	Madagascar	0.04
West Bank and Gaza	0.78	Nigeria	0.31	Albania	0.04
Cote d'Ivoire	0.77	Sudan	0.30	Iran	0.04
Kazakhstan	0.76	Indonesia	0.29	St. Lucia	0.03
Togo	0.76	Peru	0.23	El Salvador	0.03
Armenia	0.75	Macedonia, FYR	0.23	St. Vincent-Gr.	0.03
Russian Federation	0.74	Haiti	0.23	Dominican Rep.	0.03
Belarus	0.73	Costa Rica	0.21	Barbados	0.03
Lao PDR	0.73	Argentina	0.19	Tonga	0.03
Ukraine	0.66	Nepal	0.18	Suriname	0.03
Myanmar	0.65	Kenya	0.18	Yemen	0.02
Cambodia	0.62	Brazil	0.17	Algeria	0.02
Moldova	0.59	Thailand	0.17	Romania	0.02
Guinea	0.58	Malaysia	0.15	St. Kitts-Nevis	0.02
Bolivia	0.57	Korea	0.13	Dominica	0.02
Sierra Leone	0.56	Jordan	0.13	Tunisia	0.01
Congo, DR	0.55	South Africa	0.12	Fiji	0.01
Bulgaria	0.51	Egypt	0.12	Malta	0.01
Uganda	0.50	Panama	0.11	Morocco	0.01
Uruguay	0.47	Cabo Verde	0.10	Mexico	0.00
Tanzania	0.47	Solomon Isl.	0.09	Jamaica	0.00
Bosnia-Herzegovina	0.46	Ethiopia	0.09		

Notes: Share refers to the share of overall remittance inflows from low-income countries in the year 2014. The construction of the variable is explained in the text.

Table 3: Baseline results

	I	II	III	IV
	dependent variable: $corr\left(\Delta GDP, \Delta\frac{REM}{GDP}\right)$			
constant	0.051	−0.056	0.048	−0.281
	(0.033)	(0.278)	(0.039)	(0.218)
$\widehat{share}$	−0.002	0.001		
	(0.017)	(0.017)		
$\widehat{share} \times corr\_pos$			−0.066	−0.058
			(0.018***)	(0.019***)
$\widehat{share} \times corr\_neg$			0.071	0.086
			(0.025***)	(0.029***)
$\log(pcGDP)$		0.015		0.050
		(0.033)		(0.029*)
$\log\left(\frac{REM}{GDP}\right)$		0.002		0.013
		(0.023)		(0.021)
# obs.	102	102	102	102
R^2	0.000	0.002	0.252	0.27
adj. R^2	-0.010	-0.028	0.237	0.24

Notes: Estimated by OLS. A significance level of 10%, 5% or 1% is indicated by *,** and ***, respectively.

Table 4: Baseline results with regional interaction terms

	I	II
	dependent variable: $corr\left(\Delta GDP, \Delta\frac{REM}{GDP}\right)$	
constant	0.209	0.277
	(0.074***)	(0.287)
$\widehat{share} \times corr\_pos$		
$\times D^{Africa}$	−0.051	−0.054
	(0.022**)	(0.024**)
$\times D^{Asia}$	−0.122	−0.128
	(0.048**)	(0.049**)
$\times D^{LatAm}$	−0.129	−0.134
	(0.041***)	(0.042***)
$\widehat{share} \times corr\_neg$		
$\times D^{Africa}$	0.017	0.014
	(0.037)	(0.034)
$\times D^{Asia}$	0.122	0.115
	(0.039***)	(0.039***)
$\times D^{LatAm}$	0.079	0.073
	(0.033**)	(0.035**)
$\log(pcGDP)$		−0.012
		(0.032)
$\log\left(\frac{REM}{GDP}\right)$		−0.011
		(0.016)
regional dummies	*yes*	*yes*
# obs.	102	102
R^2	0.422	0.424
adj. R^2	0.366	0.353

Notes: Estimated by OLS. A significance level of 10%, 5% or 1% is indicated by *,** and ***, respectively.

Table 5: Two-Stage Least Squares Estimation

	dependent variable $corr\left(\Delta log(GDP), \Delta\frac{REM}{GDP}\right)$
constant	0.075 (0.125)
$\widehat{share} \times corr\_pos$	-0.131 (0.115)
$\widehat{share} \times corr\_neg$	0.206^{**} (0.103)
# obs.	102
R^2	-0.326
adj. R^2	-0.342

Notes: Estimated by TSLS. The instrument is a dummy variable which is one if the country was a colony of a European economy after the second world war and zero otherwise. A significance level of 10%, 5% or 1% is indicated by *,** and ***, respectively.

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Chapter 5

Do Remittance Flows Promote Financial Inclusion?

Do Remittance Flows Promote Financial Inclusion?

Immaculate Machasio*

Abstract

This paper evaluates whether remittances promote financial inclusion in developing countries. We construct an index of financial inclusion and present single equation estimates of the effects of remittances on financial inclusion. The paper uses data on remittance flows to 61 developing countries from different regions around the world spanning from 2000-2014. The study uses fixed effects as well as GMM IV estimations. The regression results confirm the hypothesis that remittances increase financial inclusion through their effect on financial sector development. This can be intuitively explained by the fact that sending and receiving remittances increase senders and recipients use of financial services. The study shows that a one percentage point increase in remittances causes financial inclusion to increase by about 2.49% per capita. Remittances can therefore be considered a catalyst of financial inclusion in development.

Keywords: Remittances, Financial inclusion, Instrumental variables.

JEL classification: C23, F34, H63.

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1 Introduction

Worldwide remittances have been on a growing trend and remain highly significant for most developing and emerging economies. Although remittances declined by 1% and 2.4% in 2015 and 2016 respectively, remittances to developing countries rebounded by about 8.5% to reach a record high of $466 billion in 2017. According to World Bank estimates, i.e. Migration and Development Brief 2018, remittances to developing countries are expected to continue to increase in 2018 by 4.1% to reach $485 billion. Most authors argue that remittances are inherently pro-poor owing to the fact that they are direct in nature and are much better targeted to the needs of the poor than Foreign Direct Investments and Official Development Assistance. Remittances go directly to their intended recipients without necessarily undergoing bureaucratic processes. As a result, these remittances provide an additional source of income to the recipients without creating administration related problems associated with Official Development Assistance as cited by Ratha and Mahopatra (2007). At the macro level remittances may stabilize the capital account of the recipient countries because they do not create future liabilities and, as opposed to other capital flows, they are more stable or even countercyclical, as depicted by Fritz et al. (2008). The aim of this paper is to evaluate whether remittances promote financial inclusion in developing countries.

Financial inclusion is an important emerging topic and a salient driver of economic development. According to the Bank of International Settlements, financial inclusion is the process of ensuring access to appropriate financial products and services needed by all members of the society in general and vulnerable groups in particular, at an affordable cost and in a fair and transparent manner by mainstream institutional players. Some researchers have cited financial inclusion as the panacea for combating poverty and most importantly the impetus for growth and development with respect to developing countries. According to Sarma and Pais (2011), financial inclusion is the ease of access, availability and usage of the formal financial system by all members of the economy. Lower levels of financial inclusion have been associated with higher crime incidence, general decline of investments, difficulties in obtaining credit and increased levels of unemployment among many other dire consequences. Researchers and practitioners working on issues of international development and poverty reduction take into consideration financial inclusion as a high-ranking agenda. For example, the United Nation's 2030 Sustainable Development Goals (SDG's) cite financial inclusion as a fundamental underpinning of wider progress, with 5 of the 17 SDG's specifically mentioning the need for improved or universal access to financial services. The Financial Inclusion 2020 initiative, which brings together major

donors, e.g. the UN and World Bank, as well as many private stakeholders, such as Citibank and Visa, convene to discuss initiatives regarding achieving financial inclusion by the year 2020. The AFI (Alliance for Financial Inclusion) was constituted in 2008 and includes members from more than 90 countries working together to advance the adoption of proven and innovative financial inclusion policy solutions.
There are two main ways in which remittances could potentially affect financial inclusion. First, remittances might increase demand for savings instruments because households might require to save the extra amount of remittances received. Second, remittances potentially increase household's likelihood of obtaining a loan because remittance records can potentially be used as a form of security for borrowing from the banks. According to Anzoategui et al. (2014), remittances increases the likelihood of having an account by at least 11%.
There are a couple of benefits associated with an inclusive financial system. Firstly, the facilitation of efficient allocation of productive resources can possibly diminish cost of capital and secondly, access to related financial services can notably cause an improvement in the day to day financial management. This therefore means that households can eventually eradicate poverty by working themselves and their families out of poverty. Thirdly, an inclusive financial system can help curtail the growth of informal sources of credit, e.g. exploitative money lenders. The aforementioned benefits are just but a few among the numerous merits of financial inclusion. Altogether, an inclusive financial system improves efficiency and welfare by providing channels for secure saving practices and by facilitating enhanced financial services.
Kempson et al. (2004) evaluate the nexus between the level of financial inclusion and income inequality. The results depict that countries with low levels of income inequality tend to have lower levels of financial exclusion, while the highest levels of exclusion are found in the least equal ones. It is also evident that small countries with a large emigrant worker population may have higher levels of financial inclusion if emigrant workers utilize the banking system for receiving remittances. According to Toxopeus and Lensink (2008), remittances are likely to stimulate development without increasing debt or administrative burden. This implies that they are likely to improve financial inclusion by virtue of providing affordable financial services within the formal system to those who tend to be excluded.
We construct our own index of financial inclusion (IFI) following Sarma (2008) to investigate macro level factors that can be associated with financial inclusion. We construct a new index because of two main reasons: firstly, previous indices omit some variables which we consider important. For example, Toxopeus and Lensink (2008) construct a predicted share of households with bank accounts to depict fi-

nancial inclusion. They regress the share of households with bank accounts on the log of deposit accounts per 100,000 people and log of average deposit account size in US Dollars. Much as their measure of financial inclusion takes into account banking penetration and usage dimensions, it is quite evident that the access dimension was omitted. The new index that we construct in this paper is therefore a broader index owing to the fact that it consists of wider range of dimensions by incorporating banking penetration, access and usage proxies. Secondly, our sample period spans a wider time frame, covering 61 economies from 2000-2014. We take into account a wider time horizon in comparison to Sarma's, whose sample period only spans 2004-2010.

A measure that aggregates several dimensions into a single multidimensional index aids in summarizing the complex nature of financial inclusion and helps to monitor its evolution. We develop a three dimension index based on various proxies which are then aggregated into a composite index. The three dimensions constitute banking penetration, access and usage. Banking penetration refers to the proportion of account holders in a certain population. Accessibility lays emphasis on geographic and demographic penetration indicators. This is key because physical distance to points of service tends to be a form of barrier to financial inclusion. Typically, in an inclusive financial system, banking services should be easily available and accessible to the users. The most prominent indicators of accessibility are banking outlets such as personnel, branches and offices. In this case, we take into account number of bank branches and number of ATMs (Automated Teller Machines) to measure access. Usage dimension entails savings and deposits patterns by use of credit and deposit proxies.

We acknowledge that a good index of financial inclusion could facilitate the process of setting national financial inclusion targets as well as monitor progress in attaining them. This is in essence effected because policy makers would be in a position to diagnose the state of financial inclusion, set targets, identify barriers, craft policies and ultimately monitor and measure policy impact. The index of financial inclusion incorporates information on these dimensions in one single number lying between 0 and 1, where zero denotes complete financial exclusion and 1 complete financial inclusion. We construct a new index taking into consideration the minimum and maximum values across countries therefore provides a good measure of comparison.

To estimate the effects of remittances on financial inclusion, this paper uses Fixed Effects Estimation as well as GMM Dynamic Panel Instrumental Variables Estimation to address endogeneity concerns. Reverse causality could be a problem because, firstly, financial inclusion might reduce the costs of sending and receiving

remittances hence is likely to make migrants more prone to send and households to receive remittances. Secondly, financial institutions could finance migration, and, consequently increase the remittance flow toward households with access to credit. One limitation of the study is the fact that, to some extent, digital cash variables are not fully captured because we include mobile subscription and internet users to incorporate mobile banking and technology respectively. Adoption of branchless banking or mobile money can increase financial access for unbanked segments by reducing costs and eliminating distance travelled to access financial services.
The rest of this paper is organized as follows: Section 2 is devoted to a critical review of the related literature regarding financial inclusion and remittances. Section 3 describes the process of constructing an index of financial inclusion. Section 4 presents the econometric methodology and data sources. The same section also provides a thorough descriptive analysis of remittances and financial inclusion. Section 5 introduces our empirical specifications while section 6 investigates the link between remittances and financial inclusion as well as the robustness of our findings. Section 7 concludes the paper.

2 Related Literature

Over the past decades, there has been a drastic surge in international remittances, giving rise to a plethora of studies which focus on remittance flows. Of prime importance to our study is research that examines the nexus between remittances and financial inclusion. According to the literature that links financial inclusion to remittance flows, most researchers focus on household survey data, implying that their research mainly focuses on a microeconomic perspective.
There have been different approaches to coming up with a proxy for financial inclusion. Although there are guidelines on financial inclusion as depicted by various financial inclusion indicators availed by the World Bank, literature on the same is inconclusive. The Global Findex database is a recent initiative by the World Bank as depicted by Demirgüc-Kunt et al. (2015). It provides interesting indicators of financial inclusion from a micro perspective based on primary country-wide surveys but unfortunately the various variables of interest only cover 2011, 2014 and 2017. This brief time span complicates panel studies since it is not enough to come up with conclusive studies. Moreover, pertinent variables like mobile money accounts are only availed in the 2014 and 2017 database, yet, it is widely known that mobile money has played a paramount role in financial inclusion at least in the context of most developing countries in Sub-Saharan Africa. Country-wide surveys involve

substantial cost in addition to being time-consuming thus making it difficult to be conducted on regular intervals.

A number of authors have attempted to construct a financial inclusion indicator. Honohan (2008) constructs estimates of the fraction of households who have access to formal financial intermediaries and afterwards does a comparison of these estimates to poverty and inequality using the Gini coefficient. The estimates are constructed by utilizing the ratio of micro finance accounts and bank accounts to total population, household survey based access and the average deposit size and GDP per capita for more than 160 countries. The main setback is that the estimates provide only a one-time measure of financial inclusion. This therefore proves to be inefficient in explaining changes over time and across countries.

Sarma (2008) takes into consideration three dimensions to measure financial inclusion: Depth (banking penetration) using a proxy measure of the number of bank accounts per 1000 population; Availability to measure proximity of access using the number of bank branches and number of ATMs per 1000 population; and Usage to measure the extent and frequency of use of the banking facilities by the customers. Due to data limitation, she takes into account credit to GDP ratio.

Prior research has focused on the role of remittances on financial inclusion in light of development. Toxopeus and Lensink (2008) posit that remittances can accelerate development without increasing debt or the adminstrative burden. Remittances are also presumed to improve financial inclusion by providing affordable financial services within the formal financial system to those who tend to be excluded. In their study, they use the predicted share of households with bank accounts to depict financial inclusion. Remittances may therefore be presumed to play a crucial role within the wider spectrum of access to finance. In explaining demand factors, Toxopeus and Lensink (2008) attest to the fact that remittance senders need financial services that offer international payments option. The demand can create the need for banking services or other financial services offered by financial institutions. On the other hand, remittances channelled through bank accounts may encourage savings and enable a better match for savings and investments in the economy. In conclusion, Toxopeus and Lensink (2008) find that remittances potentially have a development impact through the effect on financial inclusion. They demonstrate this by use of single-equation estimates on remittances and financial inclusion. This is effected by carrying out system estimates in which economic growth is explained by financial inclusion and financial inclusion by remittances.

Anzoategui et al. (2014) evaluate remittances and financial inclusion and provide evidence from El Salvador. They use data from the National Rural Household Sur-

vey to investigate whether remittances affect household use of savings and credit instruments from formal institutions. They use three disparate alternative dependent dummy variables:

1) Whether the household has a deposit account at a formal financial institution.

2) Whether the household has applied for a loan at a formal financial institution.

3) Whether the household has received a loan from a formal financial institution.

Their findings reveal that although remittances have a positive impact on financial inclusion by promoting the utilization of deposit accounts, they are not robust nor do they have a significant effect on the demand for or use of credit from formal institutions. According to Anzoategui et al. (2014), by virtue of relaxing credit constraints, remittances might dwindle the need for external financing from financial institutions , while at the same time bolstering the demand for savings instruments at least in the context of El Salvador.

Another strand of literature closely related to our research is on the relationship between remittances and financial development. Burges and Pande (2005) show that, by allowing remittance-recipient households to accumulate savings and obtain loans for productive long-term investments, the banking sector in particular can have very significant impact on the level of poverty and growth. It is evident from their study that lack of access to finance is one among the key reasons why people from low-income background remain in a state of poverty.

Orozco and Fedewa (2006) provide evidence to support the fact that remittances increase bancarization of remittance recipients, albeit at low levels. This is essentially because banks create a form of transmitting mechanism through the financial system, remittances enables remittance recipients to obtain other financial products. Consequently, remittances ought to increase domestic credit if banks extend credits to remittance recipients owing to the fact that these flows are perceived to be not only large but also stable.

Aggarwal et al. (2011) empirically explore the impact of remittances on financial system development and provide evidence that remittances promote financial development by increasing the aggregate level of deposits and credits. They investigate the nexus between remittances and financial development by laying focus on the ratio of bank deposits and credit to GDP, taking into account 109 countries spanning across 1975-2007. The results obtained are robust to using different estimation methodologies taking into consideration endogeneity concerns emanating from omitted variables, measurement error and reverse causation. The overarching conclusion is that remittances are positively associated with bank deposits and credit.

Using a panel of approximately 100 countries, Giuliano and Ruiz-Arranz (2009) em-

pirically investigate how financial development influences the impact of remittances on economic growth. Their study is based on the notion that remittances can be a substitute of financial development by providing an alternative way to finance investments and help to overcome credit constraints. The results obtained confirm that remittances enhance growth to a higher extent in countries which have less developed financial systems.

Fromentin (2017) analyzes the dynamic impact of remittances on financial development for emerging and developing countries using a Pooled Mean Group (PMG) approach. The results depict a positive long-run relationship between remittances and financial development and a significant and slightly positive short-run relationship, with the exception of low-income countries.

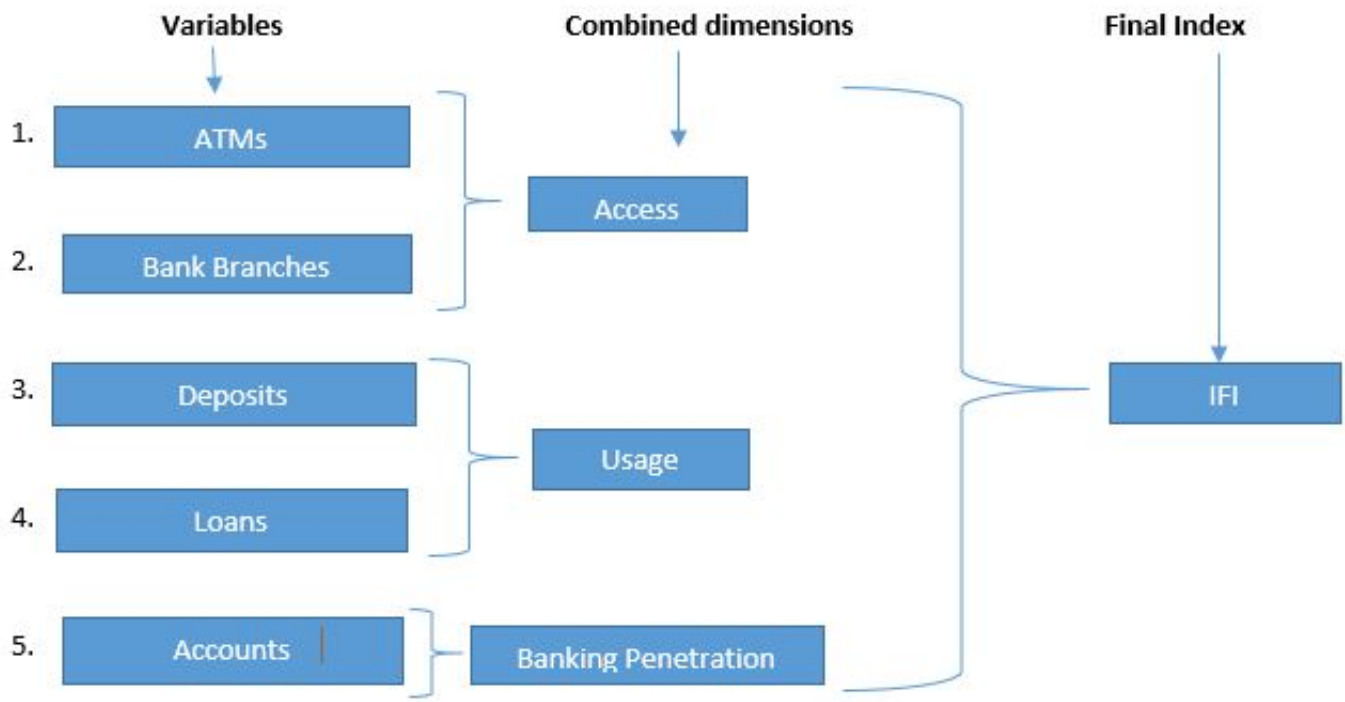
All the aforementioned strands of literature point out to the fact that there is an existing link between remittances and financial inclusion; a concept which we further investigate in this research paper.

3 Index of Financial Inclusion (IFI)

This section outlines sources and methods used to construct a multidimensional index of financial inclusion. We base our empirical analysis on a panel of 61 developing countries with annual data from 2000 to 2014. Country coverage is dictated by data availability on main variables of interest, in particular remittances and financial inclusion indicators. We embark on computing our own index of financial inclusion precisely because past studies have omitted one or the other dimensions impacting financial inclusion for various reasons. For instance, in evaluating the relationship between remittances and financial inclusion with respect to El Salvadorian households, Anzoategui et al. (2014) use three alternative dependent dummy variables to represent financial inclusion: (i) deposit accounts at formal financial institutions, (ii) loan applications from financial institutions, and (iii) loans received from financial institutions. In this case, they use each of these variables separately. This implies that each time they use one of the three alternative measures, they omit a certain important aspect of financial inclusion. On the other hand, Toxopeus and Lensink (2008) use the predicted share of households with bank accounts as their measure of financial inclusion in investigating the nexus between remittances and financial inclusion in development. Sarma (2008) uses a dimension approach in calculating an index of financial inclusion. However, consideration of credit as a share of GDP as part of the usage dimension is somehow misleading. This is because credit as a share of GDP depicts financial depth as opposed to the usage dimension of fi-

nancial inclusion. Figure 3 shows comparison between the newly constructed index and Sarma's index and the data plots suggest that the former is upward biased. As a matter of bridging the existing gap, we consider all dimensions associated with financial inclusion to be critical, therefore, we incorporate three dimensions in order to acquire a more holistic view of financial inclusion. Additionally, we comply with some important mathematical properties associated with computation of a sound index such as boundedness, unit-free property, homogeneity and monotonicity. Our approach resembles Sarma (2008), whose methodology is similar to that used by the UNDP (United Nations Development Programme) for the construction of development indices.
The figure below demonstrates the process of constructing our new index of financial inclusion:

Figure 1: Index of Financial Inclusion (IFI) construction process



The index of financial inclusion takes into account three dimensions: access, usage and banking penetration. This multidimensional approach is motivated by the notion that the inclusiveness of a financial system ought to be evaluated along several pertinent dimensions. Taking into account the multiple divergent dimensions used, there are specific financial inclusion variables which constitute the respective dimen-

sions. These variables provide useful information on the nature of inclusiveness of a financial system. When these variables are used individually, they may provide partial and incomplete information about the inclusiveness of the financial system. As a result, the inferences could be misleading because one single variable does not sufficiently capture the extent of financial inclusion.

Banking penetration dimension takes into consideration the number of bank accounts within a certain region. Bank accounts are considered to be an important measure of financial inclusion owing to the fact that in essence, all formal financial activities take place through accounts. The main reason for choosing account ownership as one of the key constituent variables of dimension for financial inclusion is that it provides an avenue for both payments and savings, which are likely to be more closely related to household decisions than credit as depicted by Allen et al. (2016). Accounts in this case provide a measure of banking penetration as an important dimension of financial inclusion. An inclusive financial system should have as many users as possible. We obtain data on account ownership from the Financial Access Survey which is compiled and published by the IMF (International Monetary Fund). The banking penetration dimension in this case takes into account bank accounts with commercial banks per 1000 adults.

For the access and usage dimensions, we initially take into account two separate variables during the dimension index computation process. After that, we calculate the average of the two respective indices to arrive at the final combined dimension indices. To illustrate this, take for instance access, a dimension which represents the availability of financial services provided by banks to its customers. Banking services should be easily accessible by the users in an inclusive financial system. In this study, we measure access using two variables: ATMs (Automated Teller Machines) per 100000 people and commercial banks per 100000 people. ATMs are computerized telecommunications devices that provide clients of a financial institution with access to financial transactions in a public place. These ATMs are widely used and are practical in the sense that they are easily accessible and operate even beyond banking halls' opening hours. Commercial bank branches are retail locations of resident commercial banks and other resident banks that function as commercial banks. They provide financial services to customers and are physically separated from the main office but they are not organized as legally distinct subsidiaries. Considering the move towards electronic banking and mobile banking, data on the availability of these alternative forms of banking ought to be incorporated. However, we do not include these other dimensions due to lack of consistent data on the same. We then derive two indices using data on ATMs and commercial bank branches. The average

of the two indices is then eventually considered as the combined index for the access dimension.

Usage takes into consideration the actual activities that take place in the accounts. Simply being in possession of a bank account is not enough for an inclusive system because it is also imperative that the banking services are adequately utilized. We consider two forms of utilization in this case: savings and loans. This is captured using data on depositors per 1000 adults and borrowers per 1000 adults respectively. Depositors with commercial banks are the reported number of deposit account holders at commercial banks and other resident banks functioning as commercial banks that are resident nonfinancial corporations and households. For many countries, data covers the total number of deposit accounts due to a lack of information on account holders. The major types of deposits are checking accounts, savings accounts, and time deposits. On the other hand, borrowers from commercial banks are the reported number of resident customers that are nonfinancial corporations. Likewise, households who obtained loans from commercial banks and other banks functioning as commercial banks are also categorized as borrowers. For the majority of countries, data covers the total number of loan accounts due to lack of information on loan account holders. The usage dimension also consists of two variables, namely depositors per 1000 adults and borrowers per 1000 adults. Both these usage variables are derived from the World Development Indicators. Sarma (2008) uses the ratio of domestic credit to GDP in depicting the usage dimension. This is where we differ because in our opinion, this ratio is more likely to reflect financial depth as opposed to usage because it provides a measure of the contribution of the financial system to economic activities.

The construction of the index of financial inclusion entails three main steps as outlined below.

3.1 Step 1: Normalization of variables

The initial step entails consideration of all the five variables that constitute elements of the final index of financial inclusion. Putting this into perspective, we initially have five variables outlined as:

1. ATMs
2. Bank Branches
3. Deposits
4. Loans

5. Accounts

We configure all these variables and report them as a share of 100,000 people. For each of these five variables, we need to construct an index bound between 0 and 1. We use each of the aforementioned variables to compute a dimension index as follows:

$$d_{i,t}^{j} = \left(\frac{A_{i,t}^{j} - m^{j}}{M^{j} - m^{j}} \right)$$

where for country i,
j=1, 2, 3, 4, 5 is the number associated with a specific variable i.e. ATMs, Bank Branches, Deposits, Loans and Accounts.
t is time.
$A_{i,t}^{j}$= Actual value of variable j.
m^{j}= Lower limit for variable j, given by the observed minimum value, $\forall i$, $\forall t$.
M^{j}= Upper limit for variable j, denoted by the maximum observed value, $\forall i$, $\forall t$.

The above computation ensures that $d_{i,t}^{j}$ lies between 0 and 1 where a higher value of $d_{i,t}^{j}$ indicates a country's higher achievement in dimension i. This implies that a country which exhibits a maximum value of a certain variable at a certain time will have a dimension index of 1. On the contrary, a country which exhibits the minimum observed value will have a value of 0.

3.2 Step 2: Combination of dimension indices

This involves a combination of dimension indices with respect to variables that represent identical dimensions. This is because, looking at it from a broader perspective, we need to merge various dimension indices which consist of respective variables depicting the same dimension. For the access and usage dimensions, the subindex is the arithmetic mean of the two constituent variables. Take for instance ATMs and Bank Branches, these two variables and the corresponding dimension indices principally represent the access dimension. On the other hand, deposits and loans depict the usage dimension. The last dimension, i.e. banking penetration is solely derived from bank accounts which is the only variable that depicts banking penetration in this study.
This process of merging the dimension indices to come up with a combined dimension indices is shown below:

1. Access dimension is calculated as: $\frac{d_{1,i,t}+d_{2,i,t}}{2} = \widetilde{d}_{1,i,t}$

2. Usage dimension is calculated as: $\frac{d_{3,i,t}+d_{4,i,t}}{2} = \widetilde{d}_{2,i,t}$

3. Banking penetration dimension undergoes no transformation but for notational consistency purposes, it is depicted as: $d_{5,i,t}=\tilde{d}_{3,i,t}$

We then end up with a combined dimension denoted as $\tilde{d}_{1,i,t}$ which represents access. The same calculation applies to the usage dimension because it is composed of two indices derived from ATMs and Bank branches variables. The resultant combined usage dimension is denoted as $\tilde{d}_{2,i,t}$. The banking penetration dimension consists of only one variable therefore the resulting dimension index is incorporated into the composite index without any form of modification. The banking penetration dimension is denoted as $\tilde{d}_{3,i,t}$.

3.3 Step 3: Computation of multi-dimensional index

The next step involves combining all the three dimensions. We work on the assumption that equal weights are attached to the various dimensions in this specific case. This therefore indicates equal importance of the respective constituent dimensions in quantifying the inclusiveness of a financial system. After obtaining the respective values of the combined dimension indices associated with access and usage as well as banking penetration dimension for various years, the index of financial inclusion ($IFI_{i,t}$) is computed as follows:

$$IFI_{i,t} = \frac{1}{2}\left[\frac{\sqrt{(\tilde{d}_{1,i,t})^2 + (\tilde{d}_{2,i,t})^2 + (\tilde{d}_{3,i,t})^2}}{\sqrt{3}} + \left(1 - \frac{\sqrt{(1-\tilde{d}_{1,i,t})^2 + (1-\tilde{d}_{2,i,t})^2 + (1-\tilde{d}_{3,i,t})^2}}{\sqrt{3}}\right)\right] \tag{1}$$

The index of financial inclusion is the simple average of two distances: the first being the normalized Euclidean distance of the various dimensions from the origin of the cartesian plane and the second is the normalized inverse Euclidean distance from the ideal point which is one in each of the three cases. Euclidean distance is basically the distance between two points defined as the square root of the sum of the squares of the differences between the corresponding coordinates of the points. According to existing literature, Euclidean distance is the only metric that is the same in all directions and as such referred to as rotation invariant. The literature

has considered this to be not only the most convenient but also the most perceptible way of representing distance between two points.

The resulting index of financial inclusion lies between 0 and 1 such that 0 denotes financial exclusion while on the other hand, 1 indicates complete financial inclusion with respect to the sample in this study. The newly constructed index of financial inclusion is therefore a measure of inclusiveness of the financial sector of the various countries in our sample. We consider it to be appropriate owing to the fact that it is not only comparable across countries but it also takes into account various important variables which impact financial inclusion.

In the subsequent regression equations, the dependent variable is a logit transformation of the newly constructed index of financial inclusion ($IFI_{i,t}$). In this case, unlike $IFI_{i,t}$ which lies between 0 and 1, the transformed variable lies between -∞ and ∞. As a result, the transformed variable is a monotonically increasing function of the $IFI_{i,t}$ and maintains the same ordering as $IFI_{i,t}$. The transformed variable appears as depicted below:

$$TIFI_{i,t} = ln\left(\frac{IFI_{i,t}}{1 - IFI_{i,t}}\right)$$

Values of IFI and TIFI are displayed in section C of the Appendix.

4 Data and Descriptive Evidence

A couple of other variables are incorporated in evaluating the relationship between financial inclusion and remittances. This is because these variables influence the degree of financial inclusion in respective countries in our sample of study.

RemGDP refers to the ratio of remittances to GDP. Personal remittances comprise personal transfers and compensation of employees. Personal transfers includes all current transfers in cash or in kind made or received by resident households from nonresident households. Personal transfers therefore consists of all current transfers between resident and nonresident individuals. Compensation of employees refers to the income of border, seasonal, and other short-term workers who are employed in an economy where they are considered nonresidents and of residents employed by nonresident organizations. The working hypothesis in this paper is that remittances contribute to financial inclusion in the sense that higher remittance inflows result into higher degree of financial inclusion.

Apart from remittances, there are other control variables which are likely to influence

financial inclusion. Key among them is the income level of households which can be measured by GDP per capita. Owing to the fact that a household's income could have a direct influence on financial inclusion, we include the natural logarithm of GDP per capita because it controls for income effects that may influence access to finance.

The literacy rate (*Litrate*) is the percentage of the population aged 15 years and above who can, with understanding, read and write a short, simple statement on their everyday life. In general terms, literacy also encompasses numeracy i.e. the ability to make simple arithmetic calculations. This indicator is calculated by dividing the number of literates aged 15 years and over by the corresponding age group population and multiplying the result by 100. Taking literacy rate into account allows for the possibility that literate households are more likely to use financial services compared to illiterate households. We therefore include the literacy rate to represent financial literacy in our regressions. In this case, higher literacy rates ought to be associated with higher levels of financial inclusion.

Domestic credit to private sector (*Domcredit*) refers to financial resources provided to the private sector by financial corporate entities. This is effected through loans, purchases of non-equity securities, and trade credits as well as other accounts receivables, that establish a claim for repayment. For some countries these claims include credit to public enterprises. The financial corporations include monetary authorities and deposit money banks, as well as other financial corporate organizations where data is available. Higher domestic credit to private sector depicts higher levels of financial inclusiveness.

Population encompasses total population which is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship. The population size plays a major role in measuring the inclusiveness of financial services that are availed to the citizens of a certain country. In our regressions, we take into account the natural logarithm of population (*Logpop*).

Mobile subscriptions refers to mobile cellular telephone subscriptions which are subscriptions to a public mobile telephone service that provide access to cellular technology. The indicator includes the number of postpaid subscriptions, and the number of active prepaid accounts. The indicator applies to all mobile cellular subscriptions that offer voice communications. This combined with internet users capture branchless banking within a certain country. In our regressions, we use the logarithmic transformed version of mobile subscription (*Logmbs*). Internet users are individuals who have used the Internet in the past 12 months. Although bank branches have been captured as part of access dimension, it is widely observed that in the recent

past most customers resort to internet banking which is deemed to be much more convenient. Both these attributes are associated with an elevated degree of financial inclusion. The variable representing internet users is *Logint*.
Control of corruption (*Ctrlcorr*) reflects perceptions of the extent to which public power is not exercised for private gain, including both petty and grand forms of corruption. The higher the value of control of corruption, the better off the country is because that implies that there are mechanisms in place to ensure that corruption is eliminated. Corruption is a vice which tends to undermine financial inclusion effects thus rendering citizens of a certain country to be excluded from mainstream provision of financial services.

AgeDR is age dependency ratio which depicts the ratio of dependents. Dependents constitute people younger than 15 years or older than 64 years expressed as a ratio to the working-age population (ages 15-64). According to the prevailing data, *AgeDR* is captured as the proportion of dependents per 100 working-age population. The lower the age dependency the higher the degree of financial inclusion and vice versa. For the sake of incorporating business cycles, we ought to utilize 5 year averages. However, owing to the fact that our sample period spans only a short period of time, we settle on year on year GDP growth rate to capture business cycle effects. We therefore include GDP growth as one of our control variables in order to capture business cycle effects.

5 Econometric Framework

We formulate the following model to examine the relationship between remittances and financial inclusion:

$$TIFI_{i,t} = \beta_0 + \beta_1 \left(RemGDP\right)_{t-1} + \beta_2 X'_{i,t} + \varepsilon_{i,t},$$

where $TIFI_{i,t}$ is the transformed logistic function of the index of financial inclusion. i refers to country and t refers to the year which in this study spans from 2000 to 2014. Since we are looking for a causal effect of remittances on financial inclusion, we use a time lag in the analysis to address endogeneity issues. *RemGDP* refers to annual remittances as a share of the Gross Domestic Product. The matrix $X'_{i,t}$ is a matrix of control variables that literature has found to affect financial inclusion and β_0 is the constant term. β_1 is the coefficient of primary interest and the error

term is denoted by $\varepsilon_{i,t}$. β_2 on the other hand is a vector which includes coefficients on the control variables.

Domestic credit to private sector as a share of GDP is a measure meant to illustrate that financial resources including loans and non equity securities are provided to the private sector. This covers financial institutions like banks and other financial corporations all measured as percentages with respect to GDP. The higher the ratio, the higher financing is to private sector in a country consequently resulting in greater opportunity and space for the private sector to develop and grow. Taking this into consideration, bolstering the private sector and making it play a salient role in a country's economy is likely to contribute to overall development of a country. This ratio is therefore deemed to be pertinent and a key factor with respect to financial inclusion.

Population and GDP per capita are also considered to play a role in financial inclusion. This captures the divergent country demographics and facilitates the understanding of the role of population concentration on the penetration of banking system. According to a report prepared by CGAP (Consultative Group to Assist the Poor) in light of the 2012 Global Findex report, it is depicted that countries with higher density and higher per capita income are associated with greater levels of financial inclusion. This intuitively implies that a larger population should increase financial access and as a result financial inclusion since this indicates a larger market size.

We also take into account mobile subscription to capture the utilization of mobile telephony for provision of financial services. This makes possible an offer of payment and a range of financial services without a bank account as the mobile phone can serve as a virtual bank card and store information related to customers and financial institutions. Though not all mobile subscribers have a mobile money account, it is widely accepted that mobile telephony reduces geographic constraints and transaction costs. By so doing, they increase the diffusion of a remote banking model without incurring prohibitive distribution costs for massive distribution. This, coupled with internet access take into account internet banking which is a recent trend which does not require physical banking outlets. Mobile banking phenomena is most widely embraced in Sub-Saharan Africa than any other region in the world.

We consider control of corruption as an important governance indicator because it is expected that low levels of corruption ought to be associated with a high level of financial inclusion and vice versa. Governments which have managed to reduce corruption levels through various proactive initiatives such as forming transparency agencies to enhance transparency and accountability have realized unprecedented

levels of financial inclusion.

We took into consideration literacy rate as a proxy for financial literacy because data on financial literacy was not available. The rationale behind settling on this is that literate citizens are more likely to take initiative and make use of financial services thus be financially included as opposed to the illiterate ones. Atkinson and Messy (2013) define financial literacy as a combination of a host of attributes such as awareness, knowledge, skill, attitude and behaviour necessary to come up with sound financial decisions and ultimately achieve financial wellbeing. In order to comprehend financial planning, a person should be financially literate and able to understand the importance of preparing household budgets, cash-flow management and asset allocation in order to meet financial goals. Generally, financial literacy is one of the major challenges facing countries across the globe, irrespective of their level of economic development and has been receiving significant attention from policy makers worldwide. When literacy is taken into consideration, it is often considered a hidden hurdle to bringing financial inclusion to the unbanked. Most times, systems that should work in theory break down when poor people are unable to learn how to use them or are unable to learn how to use them or are unable to assume the accountability of consumers who know their rights and how to obtain recourse to maintain transparency and honesty in the system.

Lower age dependency ratio would imply higher levels of financial inclusion and the converse is true when we have a high age dependency ratio. Essentially, a lower age dependency ratio implicitly means that majority of the country's citizens are in a position to fend for themselves and they do not necessarily depend on others to access financial services. A high age dependency ratio on the other hand implies that a larger segment of the population are either too young or above the retirement age, which impedes their access to financial services as they do not earn income.

We follow Arellano and Bover (1995) and Blundell and Bond (1998) in carrying out GMM estimations. We use GMM instrumental variables approach in our estimations because it is well suited to deal with endogeneity issues. It is common in financial inclusion regression that some of the explanatory variables are endogenous. This endogeneity may bias estimates of how the independent variables in equation may affect the dependent variable in equation. The major sources of endogeneity are likely to arise due to either unobservable heterogeneity or simultaenity. In normal cirumstances, to eliminate unobservable heterogeneity, conventional fixed estimations are used. However, this estimation assumptions hold only when we assume that country characteristics or structures are strictly exogenous. i.e considered to be purely random observations through time unrelated to country's history. This is

however a very strong assumption which is unlikely to be valid in reality. While OLS estimation may be biased due to the fact that it ignores unobservable heterogeneity, fixed effects may be biased owing to the fact that it neglects endogeneity. GMM is considered a more efficient estimator in comparison to other estimators because it can avoid the bias that ordinary least square suffers when an explanatory variable in a regression is correlated with the regression's disturbance term. Moreover, GMM provides powerful instruments which account for simultaneity while eliminating any unobservable heterogeneity.

In order to effect GMM IV regressions, we utilize OECD growth as our instrument. The main reason as to why we settle on OECD growth is because we consider it to be not only relevant but also valid. It is correlated with other endogenous variables while at the same time orthogonal to the error process. We test the correlation aspect by examining the fit of the first stage regressions. The validity of our model is supported by a number of indicators:

Hansen J test (1982) of over-identifying restrictions tests validity of instruments. According to our regression results, the variables are found to be orthorgonal to the error process of financial inclusion on the basis of the Hansen J test results. The implication therefore is that the choice of growth of OECD countries as an instrument is considered valid for this research. The joint null hypothesis of the Hansen test is that the instruments are exogenous. The foregoing statement implies that they are not correlated with the error term and that the excluded instruments are correctly excluded from the estimated equation. This therefore means that the choice of instrument is appropriate.

Additionally, the Arellano Bond test checks for autocorrelation in the idiosyncratic disturbance term in order to ascertain that the instruments are valid according to Roodman (2009). In this case, there is sufficient evidence to suggest no serial autocorrelation.

We applied the Windmeijer finite sample correction to standard errors in order to evaluate the precision of the two-step estimators for hypothesis tests.

6 Empirical Evidence

6.1 Baseline Results

The estimation results from GMM IV model yield the expected sign on the coefficient of *RemGDP* thus supporting the hypothesis that remittances have a positive and significant impact on financial inclusion. A country which receives remittances amounting to 1% of GDP will enjoy an advantage of 2.49% improvement in financial

inclusion. Improvement in financial inclusion is manifested through increment of the respective variables which constitute the newly computed index of financial inclusion. This implies that with respect to this research, countries used in the sample exhibit increased number of ATMs, bank branches, deposits, loans as well as bank accounts as the magnitude of remittances as a share of GDP increases.

<< insert table 2 here >>

According to Hansen J statistics, the P value 0.179 implies that the null hypothesis cannot be rejected. The inference here is that over-identifying restrictions are valid. With regard to instrumentation, our estimations employ lags limitation thus confining the instrument count in such a way that instrument used are always less than the number of panel groups.
Regarding Arellano-Bond test, our result is consistent as there is no second order autocorrelation. The P-value of AR(2) is 0.352 which fails to reject the null hypothesis of no second order autocorrelation.

6.2 Robustness Exercises

We carry out a number of robustness checks including: Fixed Effects estimations, consideration of individual respective indicators and regional groups.
We use fixed effects estimations as an alternative to GMM estimations to illustrate that our results hold. Fixed effects estimations take into consideration both country and period fixed effects. Country fixed effects control for unobserved time-invariant country features. The results which we obtain are pretty similar to GMM estimation results, though the coefficient of 1.25% obtained is lower than the coefficient resulting from GMM estimation. However, the theoretical underpinning is the same. Most of the coefficients on other control variables exhibit the expected signs and are significant. Carrying out fixed effects estimation in this case is likely to result in obtaining biased estimates. All in all, our overall regression results are interpreted with respect to the results obtained from GMM estimations because we consider GMM to be a better estimator.[1] Once again the results obtained from the fixed effects methodology confirm the hypothesis that remittances promote financial inclusion.

<< insert table 2 here >>

Categorization of countries into regional groups paves way for evaluating the extent to which remittance inflows into various countries in divergent regions around the world promote financial inclusion. We therefore split the sample by geographic

[1] GMM estimations takes into account lagged endogenous variables which are not captured when fixed effects estimations are carried out.

region. We consider this to be an important aspect to facilitate comparison between regional groups. This is a salient feature especially when we take policy implications into consideration because countries in these regions can benchmark against each other and make necessary reforms subject to necessity. The results suggest a positive remittances-financial inclusion nexus with exception of two regions: East Asia and Pacific and Southern Asia. However, fixed effects estimation results for South Asia is consistent with the overall expected results. On the contrary, results observed for East Asia and Pacific consistently display a negative coefficient. The most obvious explanation for this is the fact that only three countries feature as representantive countries among our sample that fall within East Asia and Pacific region. In this case therefore, sample size is a limiting factor and most probably contributes to mixed results.

<< insert table 3 here >>

The computation of the index of financial inclusion incorporated three dimensions which consequently resulted from taking into account various individual respective indicators. As part of our robustness checks, we take into account certain specific indicators which are considered to be at the center stage of financial inclusion. This supports the hypothesis that each of the indicators was useful and rightly included as an indicator of financial inclusion. Usage and banking penetration yield results which bear the expected sign. However, in the case of access, the coefficient is negative but all the same it is not significant. Prior studies have also taken into account bank account as a proxy for financial inclusion although it is well acknowledged that number of bank accounts as a measure on their own do not sufficiently measure the extent of financial inclusion. We also run regressions taking into consideration bank accounts as our dependent variable. We obtain consistent results in the sense that the coefficient on remittances as a share of GDP is positive and significant. These results confirm that the constituent components of the index of financial inclusion earlier constructed are not only relevant but also valid. Consequently, the individual respective dimension indices and corresponding composite index is well constructed and deemed to be reliable.

<< insert table 4 here >>

7 Conclusions

To emphasize the importance of remittances for developing countries, a lot of literature examines the impact of remittances on various aspects of countries' develop-

ment. However, little attention has been dedicated to examine the nexus between remittances and financial inclusion. This paper sheds more light on the relationship between remittance inflows and financial inclusion. We employ GMM IV estimation as our main model and compare our results with the outcome of fixed effects estimation to support our results.

We consider financial inclusion and remittances to be important variables worth examining because both are attributed to inclusive economic growth and poverty reduction. From a theoretical perspective, we could link up these two notions by stating that by the very aspect of sending remittances, migrants play the role of financial intermediaries. This is because they facilitate the process through which households and small scale entrepreneurs go to overcome credit constraints and imperfections in financial markets. This therefore suggests that remittances do in fact pave the way for financial inclusion through financial development channel.

The results depicted from this study give evidence to support the hypothesis that remittances contribute to financial inclusion. Our results suggest that increasing remittance flows positively and significantly improves financial inclusion. On average, a country that receives remittances increase to the tune of 1% of GDP is likely to experience approximately 2.49% increment in the degree of financial inclusion. Our results still hold after controlling for unobserved country characteristics and GMM IV regressions to correct for potential endogeneity of remittances. It can also be observed that the average marginal effect of remittances on financial inclusion is more pronounced at higher levels of remittances as a proportion of GDP.

Our research is beset by data limitations. Much as it would be important to incorporate data on internet banking and mobile banking, we are constrained by data availability since these variables are not available within the time spectrum of our study. Measurement error is also known to be inherent in remittances data. Since quality data is key for provision of appropriate policy guidance, it is imperative for responsible institutions to work on means of improving data collection, recording and reporting. This is likely to improve the quality of research and the resultant policy recommendations for respective policy makers.

Considering the implication of this research from a policy perspective, it would be important for policy makers to formulate and implement policies that encourage migrant workers to remit. Efforts should be undertaken to improve financial system efficiency because remittance flows through formal channels are more likely to have a positive effect on financial inclusion as opposed to remittances through informal channels. Aiming at reducing remittance costs is also very important. Reducing transaction fees will motivate poor migrants to remit since their disposable income

will not significantly drop as a consequence of remitting funds. This is because remittances and the associated costs of remitting funds will only account for a relatively small portion of migrants' disposable income.

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8 Data Sources and Definitions

- *RemGDP* is the ratio of remittance inflows to GDP. Personal remittances comprise personal transfers and compensation of employees. Personal transfers consist of all current transfers in cash or in kind made or received by resident households to or from nonresident households. Personal transfers thus include all current transfers between resident and nonresident individuals. Compensation of employees refers to the income of border, seasonal, and other short-term workers who are employed in an economy where they are not resident and of residents employed by nonresident entities. Data are the sum of two items defined in the sixth edition of the IMF's Balance of Payments Manual: personal transfers and compensation of employees. This data is from World Bank World Development Indicators.

- *DomCredit* is domestic credit to private sector which refers to financial resources provided to the private sector by financial corporations, such as through loans, purchases of non-equity securities, and trade credits and other accounts receivable, that establish a claim for repayment. For some countries these claims include credit to public enterprises. The financial corporations include monetary authorities and deposit money banks, as well as other financial corporations where data are available (including corporations that do not accept transferable deposits but do incur such liabilities as time and savings deposits). This data is from World Bank World Development Indicators.

- *Logpop* is the natural logarithm of population. Total population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship. The values shown are midyear estimates. This data is derived from World Bank World Development Indicators.

- *Logxr* is the natural logarithm of exchange rate. Official exchange rate refers to the exchange rate determined by national authorities or to the rate determined in the legally sanctioned exchange market. It is calculated as an annual average based on monthly averages (local currency units relative to the U.S. dollar). This data is derived from World Bank database captured as part of the World Development Indicators.

- *Logmbs* is the natural logarithm of mobile subscriptions. Mobile cellular telephone subscriptions are subscriptions to a public mobile telephone service that provide access to cellular technology. The indicator includes (and is split into)

the number of postpaid subscriptions, and the number of active prepaid accounts (i.e. that have been used during the last three months). The indicator applies to all mobile cellular subscriptions that offer voice communications. It excludes subscriptions via data cards or USB modems, subscriptions to public mobile data services, private trunked mobile radio, telepoint, radio paging and telemetry services. This data is derived from World Bank database captured as part of the World Development Indicators.

- *Ctrlcorr* denotes control of corruption. This reflects perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests. This data is derived from World Governance Indicators. The Worldwide Governance Indicators (WGI) are a research dataset summarizing the views on the quality of governance provided by a large number of enterprise, citizen and expert survey respondents in industrial and developing countries. These data are gathered from a number of survey institutes, think tanks, non-governmental organizations, international organizations, and private sector firms.

- *AgeDR* is age dependency ratio. Age dependency ratio is the ratio of dependents (people younger than 15 or older than 64) to the working-age population i.e. those ages 15-64. Data are shown as the proportion of dependents per 100 working-age population. This data is derived from World Bank database captured as part of World Development Indicators.

- *lnGDPpc* is the logarithm of GDP per capita. GDP per capita is gross domestic product divided by midyear population. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in current U.S. dollars. This data is derived from World Bank database captured as part of World Development Indicators.

- *Logint* refers to the logarithm of internet users. Internet users in this case are defined as individuals who have used the Internet (from any location) in the last 12 months. Various channels through which internet can be accessed include but are not limited to via a computer, mobile phone, personal digital assistant, games machine, digital TV etc. This data is derived from the World Bank database captured as part of the World Development Indicators.

- *Litrate* denotes literacy rate. Percentage of the population age 15 and above who can, with understanding, read and write a short, simple statement on their everyday life. Generally, literacy also encompasses numeracy, the ability to make simple arithmetic calculations. This indicator is calculated by dividing the number of literates aged 15 years and over by the corresponding age group population and multiplying the result by 100. This data is derived from the World Bank database captured as part of the World Development Indicators.

A Country Coverage

Argentina	Dominican Republic	Lebanon	Rwanda
Azerbaijan	DR Congo	Lesotho	Sao Tome and Principe
Bangladesh	Ecuador	Libya	Seychelles
Belize	Egypt	Madagascar	Sierra Leone
Botswana	Equitorial Guinea	Malawi	Singapore
Brazil	Estonia	Maldives	Solomon Islands
Cabo Verde	Ethiopia	Mauritania	Swaziland (Renamed to eSwatini)
Cameroon	Gabon	Moldova	Syrian Arab Republic
Chad	Georgia	Myanmar	Tajikistan
China	Hungary	Namibia	Thailand
Colombia	Israel	Nigeria	Uganda
Comoros	Kenya	Pakistan	Uruguay
Congo	Kuwait	Paraguay	Yemen
Costa Rica	Kyrgyzstan	Peru	
Croatia	Lao People's DR	Qatar	
Djibouti	Latvia	Rwanda	

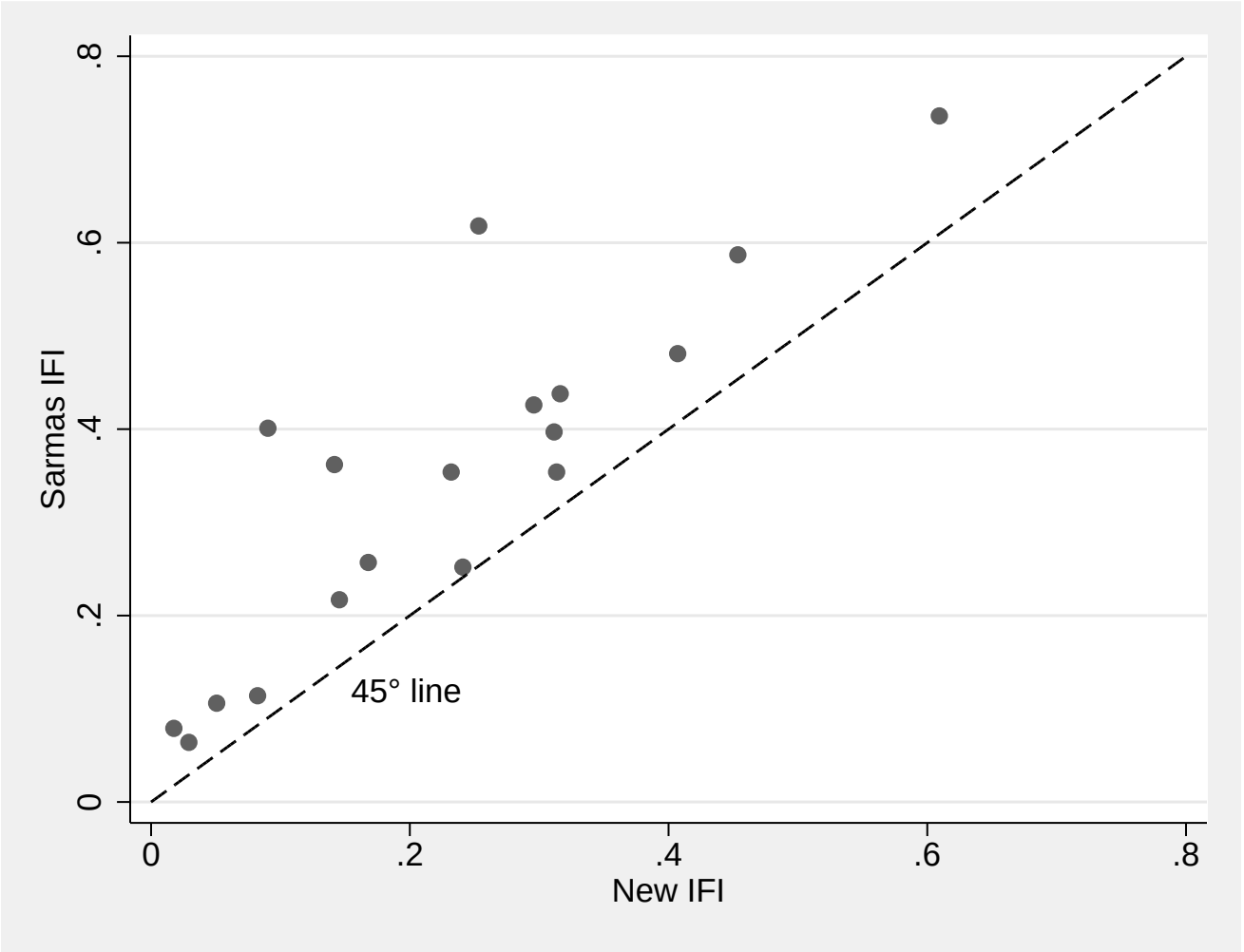
Table 1: Summary statistics

Variable	Observations	Mean	Std. Dev	Max	Min
TIFI	671	-2.1958	1.4993	0.5726	-8.8455
RemGDP	671	4.8488	8.1470	49.290	0.0000
Ctrlcorr	671	-0.3883	0.7757	2.4167	-1.8365
AgeDr	671	65.049	19.079	108.57	17.031
Litrate	671	19.501	36.527	99.896	0.0000
DomCredit	671	32.267	28.325	147.00	0.0000
Logmbs	665	3.7752	1.1626	5.3865	-1.6854
lnGDPpc	661	7.9470	1.3669	11.461	4.9125
Logpop	671	15.716	1.9398	21.034	11.321
Logint	665	2.3096	1.5130	4.5162	-3.7157
GDPg	661	331.00	190.96	661.00	1.0000

Notes: We derive the variables displayed from various sources as documented under section 8

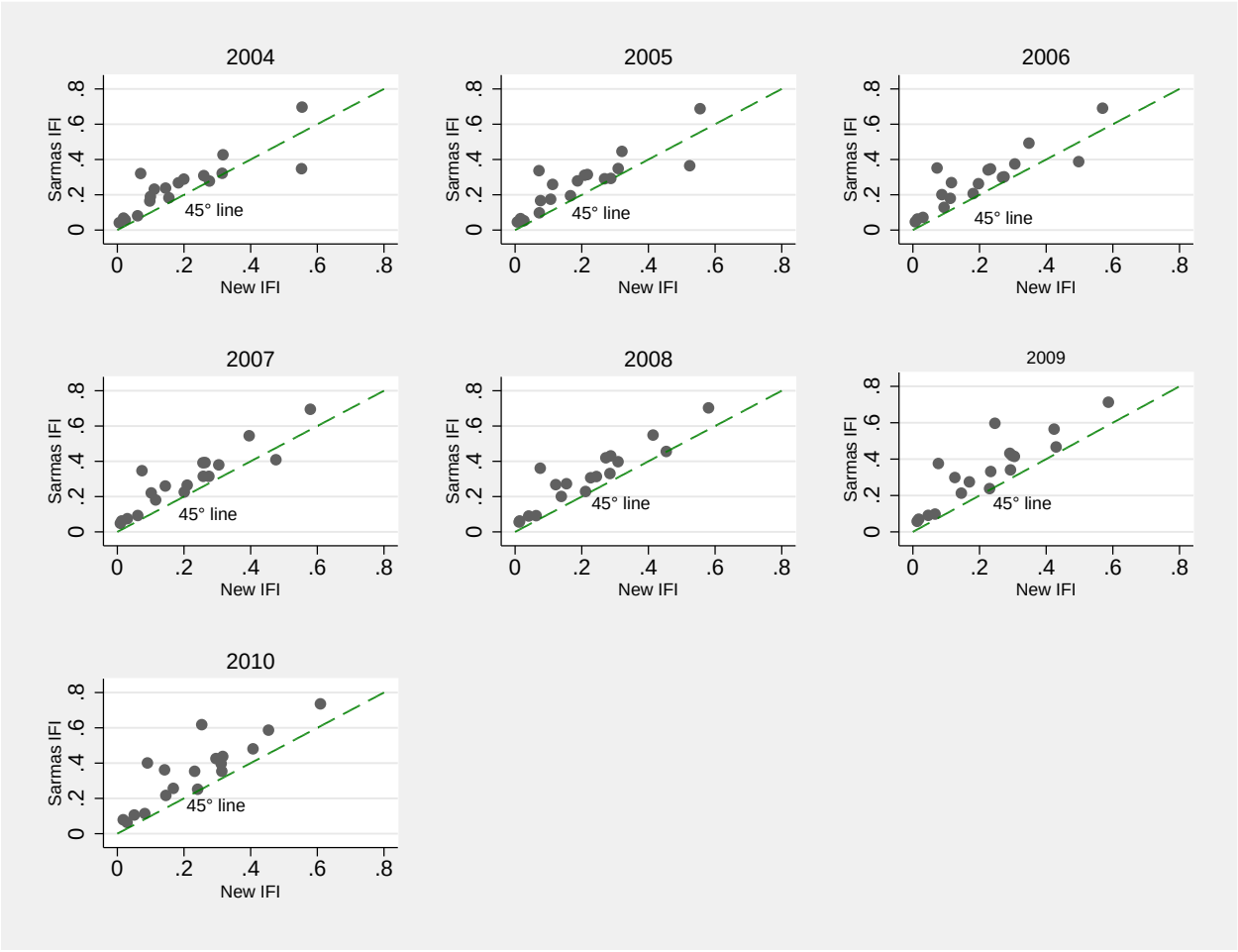
B Figures and Tables

Figure 2: Comparison between Sarma's index and the newly constructed index



Notes: We utilized 2010 indices data for both the newly constructed index and Sarma's index for comparison purposes because that was the most recent year when Sarma's index was available.

Figure 3: Year to year comparison between Sarma's index and the newly constructed index



C IFI and Transformed TIFI

Country	IFI	TIFI	Country	IFI	TIFI
Argentina	0.3352	-0.2974	Latvia	0.4412	-0.1026
Azerbaijan	0.2298	-0.5253	Lebanon	0.2657	-0.4415
Bangladesh	0.1547	-0.7377	Lesotho	0.0986	-0.9608
Belize	0.2532	-0.4698	Libya	0.2723	-0.4270
Botswana	0.2096	-0.5764	Madagascar	0.0193	-1.7063
Brazil	0.3625	-0.2451	Malawi	0.0672	-1.1426
Cabo Verde	0.4931	-0.0120	Maldives	0.4059	-0.1654
Cameroon	0.0209	-1.6707	Mauritania	0.0436	-1.3407
Chad	0.0074	-2.1247	Moldova	0.3400	-0.2881
China	0.1386	-0.7936	Myanmar	0.0415	-1.3641
Colombia	0.5263	0.0458	Namibia	0.2958	-0.3767
Comoros	0.0297	-1.5139	Nigeria	0.1756	-0.6718
Congo	0.0110	-1.9548	Pakistan	0.0850	-1.0319
Costa Rica	0.3727	-0.2260	Paraguay	0.1230	-0.8532
Croatia	0.5653	0.1141	Peru	0.2503	-0.4764
Djibouti	0.0480	-1.2972	Qatar	0.2805	-0.4092
Dominican Republic	0.2309	-0.5226	Rwanda	0.0501	-1.2780
DR Congo	0.0379	-1.4049	Samoa	0.2915	-0.3856
Ecuador	0.2403	-0.4998	Sao Tome and Principe	0.2090	-0.5781
Egypt	0.1148	-0.8873	Seychelles	0.5165	0.0286
Equitorial Guinea	0.0917	-0.9958	Sierra Leone	0.0595	-1.1991
Estonia	0.6602	0.2885	Singapore	0.6919	0.3513
Ethiopia	0.0528	-1.2538	Solomon Islands	0.1213	-0.8599
Gabon	0.1266	-0.8389	Swaziland	0.1623	-0.7128
Georgia	0.4413	-0.1025	Syrian Arab Republic	0.0625	-1.1760
Hungary	0.3853	-0.2029	Tajikistan	0.2327	-0.5181
Israel	0.5218	0.0380	Thailand	0.4583	-0.0727
Kenya	0.2896	-0.3896	Uganda	0.0521	1.2600
Kuwait	0.2143	-0.5642	Uruguay	0.3481	-0.2726
Kyrgyzstan	0.1217	-0.8585	Yemen	0.0347	-1.4439
Lao People's DR	0.1336	-08121			

Table 2: Baseline Results

GMM & Fixed Effects Results		
Variable	GMM	Fixed Effects
Dependent variable: TIFI		
RemGDP	2.49	1.25
(*10^{-2})	[1.94]*	[1.97]**
DomCredit	0.71	0.33
	[1.85]*	[7.70]***
Ctrlcorr	0.54	0.40
	[1.69]*	[2.66]**
AgeDR	1.64	1.49
(*10^{-2})	[0.97]	[2.11]**
lnGDPpc	0.32	0.38
	[1.32]	[5.61]***
Litrate	0.05	-0.35
(*10^{-3})	[0.02]	[-0.85]
Logpop	-3.69	10.24
(*10^{-2})	[-0.34]	[0.75]
Logmbs	0.33	0.05
	[2.36]**	[1.25]
GDPg	0.60	5.17
(*10^{-3})	[2.18]**	[1.65]*
No. of countries	61	61
No. of observations	583	583
Hansen Test	0.179	

Notes: Absolute values of z and t statistics are in brackets. The symbols *, ** and *** denote significance at 10%, 5% and 1% level respectively.

Table 3: GMM Regional Groups Results

GMM Estimation Results						
Variable	MENA	EAP	SSA	SA	ECA	LAC
Dependent variable: TIFI						
RemGDP	0.88	-3.37	0.79	-2.12	0.05	1.45
(*10^{-2})	[1.69]*	[-3.43]*	[1.55]	[-0.54]	[0.05]	[2.18]**
DomCredit	0.20	0.16	-0.02	0.27	0.26	0.23
	[1.80]*	[1.83]*	[-0.32]	[1.76]*	[1.99]**	[1.72]*
Ctrlcorr	-0.15	-0.01	0.03	0.06	0.07	0.14
	[-0.62]	[-0.07]	[0.33]	[0.52]	[0.93]	[0.81]
AgeDR	0.35	0.92	-0.34	0.87	0.01	1.02
(*10^{-2})	[1.08]	[1.84]*	[-0.62]	[1.59]	[1.86]*	[1.89]*
lnGDPpc	0.15	0.09	-0.02	0.08	0.09	0.07
	[1.93]*	[1.70]*	[-0.30]	[1.34]	[1.53]	[1.09]
Litrate	0.57	0.58	0.70	0.07	0.74	1.22
(*10^{-3})	[0.62]	[0.63]	[1.35]	[0.07]	[0.68]	[1.15]
Logpop	-0.75	-0.03	1.51	0.60	1.33	3.77
(*10^{-2})	[-0.15]	[-0.07]	[0.56]	[0.16]	[0.37]	[0.99]
Logmbs	-0.04	-0.01	-0.01	0.01	0.02	0.01
	[-0.64]	[-0.15]	[-0.30]	[0.16]	[0.72]	[0.20]
GDPg	5.74	7.12	4.09	5.62	7.56	7.81
(*10^{-4})	[1.50]	[2.36]**	[1.44]	[1.66]*	[1.90]*	[2.11]**
No. of countries	9	7	23	3	9	10
No. of observations	82	64	220	30	9	100
Hansen Test	0.394	0.508	0.359	0.527	0.783	0.693

Notes: Absolute values of z statistics are in brackets. The symbols *, ** and *** denote significance at 10%, 5% and 1% level respectively.

Table 4: GMM Respective Indicators Results

GMM Estimation Results				
Variable	Usage	Banking Penetration	Access	Bank Accounts
Dependent variable: TIFI				
RemGDP	4.72 [1.82]*	6.97 [1.91]*	-0.57 [-0.31]	5.41 [1.94]*
DomCredit	132.08 [2.68]**	33.90 [0.36]	41.67 [1.26]	-109.91 [-1.32]
Ctrlcorr	72.78 [1.38]	152.30 [1.64]	20.97 [0.53]	-60.73 [-0.58]
AgeDR	4.10 [1.43]	4.34 [1.16]	-0.21 [-0.11]	6.26 [1.48]
lnGDPpc	44.81 [1.33]	31.11 [0.68]	46.25 [1.90]*	113.92 [2.01]**
Litrate	0.19 [0.62]	0.62 [1.35]	0.32 [1.16]	0.70 [1.12]
Logpop	-6.89 [0.717]	0.87 [0.04]	0.71 [0.05]	8.06 [0.30]
Logmbs	16.14 [0.81]	47.81 [1.54]	48.18 [3.39]**	43.68 [1.17]
GDPg	0.12 [2.39]**	0.12 [2.47]**	0.07 [2.63]**	0.16 [1.48]
No. of countries	61	61	61	61
No. of observations	583	583	583	583
Hansen Test	0.114	0.185	0.351	0.333

Notes: Absolute values of z statistics are in brackets. The symbols *, ** and *** denote significance at 10%, 5% and 1% level respectively.

Conferences with Review Process:

- *MAGKS Doctoral Colloquim*, Rauischholzhausen, Germany, September 21-22, 2017.
- *Southern Economic Association 88th Annual Meeting*, Washington D.C, U.S.A, November 18-20, 2018.

This paper is available as:

Machasio, I. (2018): 'Do Remittance Flows Promote Financial Inclusion?', *MAGKS Joint Discussion Paper Series in Economics* 26-2018.

Chapter 6

Concluding Remarks

The dynamics surrounding remittances and their impact on recipient economies have been studied by a vast number of researchers. However, the greatest challenge has been to reach a consensus pertaining characteristics of these flows. To the extent that researchers provide mixed evidence, it becomes overly complicated to formulate optimal policies because there will be reservations on the part of the policy makers.

The four papers encompassed in this thesis shed light on some of the most pertinent issues surrounding remittances. They attempt to contribute to the existing literature on remittances and their impact on developing economies as well as introduce new insights.

The result of the first paper supports the notion that remittances act as a shock absorber and can potentially cushion economies against negative shocks. The underyling concept takes into consideration countercyclical remittances. The insight provided in this case corroborates with prior researchers who provided evidence to the effect that remittances help countries during financial crises, conflicts, disasters among other forms of negative shocks.

The second paper suggests that procyclical remittances pose a challenge to monetary policy because remittances would further boost a heated economy thus forcing the central bank to embrace more aggressive interest rates. There is likelihood of adverse effects being observed because high interest rates will attract capital flows resulting in exchange rate appreciation and ultimately Dutch-disease phenomenon. The converse holds during a recession.

We disentangle and demystify cyclicality of remittances in the third paper. We demonstrate that a greater proportion of remittances emanating from low and middle income countries are acyclical because when a distinction is made between North-South and South-South flows, it is evident that South-South flows exhibit reduced cyclical patterns. This, in effect introduces a new perspective and insight owing to the fact that countercyclical remittances have proven to have yielded positive outcomes with respect to developing countries.

The last paper in this dissertation brings to light the impact of remittances on financial inclusion. The results show that indeed remittances promote financial inclusion to a great extent. With respect to developing economies which are strategizing poverty reduction measures as well as inclusive economic growth measures, efforts could be dedicated toward creating a favorable environment to facilitate international remittance flows.

All in all, the empirical results would help to formulate appropriate policies that would harness the maximum benefits associated with remittance inflows.

Moving forward, it is imperative to leverage on digital revolutions to create new technologies that allow remittance transfer organizations to reduce transaction costs and open new channels. This will greatly enhance convenience for remitters and ultimately improve transparency levels as well as accountability for regulators and policy makers. On the other hand, policy makers

have to keep a watchful eye on the remittance trends and intervene where necessary to mitigate potential interference with monetary policy transmission process.

There are high prospects of future innovations enabling migrants to have a better grasp and control over alternative uses of remittances. This could be in form of human capital investments or investments in small and medium sized enterprises. Policy makers can also channel remittances toward development oriented projects. Within this whole framework, we acknowledge that remittances are private transfers and they can only be leveraged through coming up with incentives that preserve the rights of migrants while enhancing pro-development measures. Priority should therefore be given to projects that rank high within the needs hierachy of the local population.

Additionally, future research should critically address the methodological issues in studying international remittances. Aggregate remittances figures availed on various websites do not capture informal flows. This calls for concerted efforts to create a platform which involves both migrants and recipient households data in order to come up with more reliable estimates.

Affidavit

I hereby declare that I completed the papers submitted and listed hereafter independently and only with those forms of support mentioned in the relevant paper or in the following supplementary list. When working with the authors listed, I contributed no less than a proportionate share of the work. In the analyses that I have conducted and to which I refer in the papers, I have followed the principles of good academic practice, as stated in the Statute of Justus Liebig University Giessen for Ensuring Good Scientific Practice.

Immaculate Nafula Machasio
Giessen, November 30, 2018

Submitted Papers:

1. Machasio, I. (2016): 'The Role of Remittance Inflows to Developing Countries in the Aftermath of Sovereign Defaults', *MAGKS Joint Discussion Paper Series in Economics* 39-2016.

2. Machasio, I., & Tillmann, P. (2016): 'Remittance Inflows and State-Dependent Monetary Policy Transmission in Developing Countries', *MAGKS Joint Discussion Paper Series in Economics* 38-2016.

3. Machasio, I., & Tillmann, P. (2017): 'Are Remittances Cyclical? The Role of South-South Flows', *Journal of International Trade, Politics and Development, 1,* 33-48.

4. Machasio, I. (2018): 'Do Remittance Flows Promote Financial Inclusion?', *MAGKS Joint Discussion Paper Series in Economics* 26-2018.